MURPHY CREEK PROJECT

RECREATION AND TOURISM

IMPACT ASSESSMENT

FINAL REPORT

Prepared For

BRITISH COLUMBIA HYDRO AND POWER AUTHORITY

by

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This impact assessment is based on the "Murphy Creek Project Engineering Description" prepared in November 1982. Since that time, ongoing planning and design studies have resulted in some changes that would affect the project description. The principal changes are as follows:

- In-service date has changed from 1993 to 1995.

- Installed capacity has changed from 300 MW to 275 MW.

- Small changes to the design and locations of shoreline protective works.

- Daily reservoir level fluctuations limited to 2.0 m during March, April and May (previously March and April).

The above changes have been incorporated in the report only where they would affect the results of the impact assessment.

PREFACE

The impacts of the proposed Murphy Creek Project are estimated over a span of years in this study. Since the area's population level is projected to be relatively constant and there are no major anticipated shifts in recreation patterns, a change in the inservice date of the project would have little effect on the projected impacts.

EXECUTIVE SUMMARY

The impoundment of the proposed Murphy Creek hydro-electric project would flood some areas with recreational value, bisect a 300 mile long navigable waterway, and reduce fish populations by restricting migration and flooding spawning and rearing areas.

Since a wide range of recreational opportunities are available at numerous locations throughout the West Kootenays, changes in recreation and tourist activity in the study area will likely take the form of shifts to other locations. Since one-half of tourist visits to the area are to visit friends or tourists passing through on the way to other destinations, and since similar recreation opportunities are available nearby, changes in opportunities due to the project are unlikely to have much impact on the volume of tourist traffic.

The principal impact would be on the local fishery. Numbers of rainbow trout, which account for two-thirds of total angler hours, would be substantially less. Other sport species like mountain whitefish, Dolly Varden, and burbot would experience moderate declines. Kokanee numbers would be expected to remain about the same.

The affected fishery is very much a local resident fishery. Ninety percent of fishermen interviewed in a Fish and Wildlife Branch creel census were from neighbouring communities. The average fishing time is only 1.29 hours suggesting an after-work

fishery used intensively (an average of 57 days per fisherman) by a small number of local fishermen.

At the El. 424 m reservoir level the recreational resources at Pass Creek Park as well as the ball field in North Castlegar can be retained.

Possible mitigation, compensation, and enhancement options include a local hatchery to counter the predicted decline in fish stocks, facilities to enhance the boating opportunities created, a provision for moving boats around the dam, recontouring of the shoreline along the reservoir in North Castlegar, and a possible campground development. The impact of mitigation, compensation, and enhancement initiatives is, like the impacts of the proposed project itself, reduced by the availability of other similar recreation opportunities near by.

MURPHY CREEK PROJECT

RECREATION AND TOURISM

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1. INTRODUCTION

B. C. Hydro and Power Authority retained the services of Edwin, Reid and Associates to assess the probable impact of the proposed Murphy Creek hydroelectric generation project on the Columbia River between the cities of Castlegar and Trail.

The proposed Murphy Creek Project would be located on the Columbia River in the vicinity of Oasis, B.C. approximately 30 kilometres north of the U.S. border. The impoundment would extend up to the tailraces of the Hugh Keenleyside Dam on the Columbia River and the Brilliant Dam on the Kootenay River just above the confluence of the two rivers. This section of the Columbia River flows south through a narrow valley between the Monashee Mountains and the Bonnington Range of the Selkirk Mountains.

The proposed project would raise the Columbia River about 14 m at the project site. B.C. Hydro has specified two reservoir operating regimes. Operating Regime 2 is preferred because it maximizes heads available for electrical power generation and because it allows a relatively constant reservior level year round. However, as there is no certainty that this Regime would be in effect imediately following completion of the project, it has been assumed that the project would operate under Operating Regime 1 during the initial years. Under this Regime, the reservoir would be drawn down as much as 10 m between February

and June to enable the storage reservoir (Arrow Lakes Reservior) above the Hugh Keenleyside Dam to be emptied prior to the Spring run-off. With the exception of the annual draw-down, the daily fluctuations in reservoir water level would be limited to 2 m during March and April and 1.5 m in other months.

As documented in the following sections, recreation and tourism are important in the West Kootenay region. The area's natural beauty, mountainous terrain, numerous lakes and rivers, and climate combine to provide an important outdoor recreation resource for people living in and traveling to the area.

The "study area" identified for the Murphy Creek Project consists of "all lands on either side of the Columbia River from the axis of the proposed dam in the vicinity of Oasis, upstream to the Hugh Keenleyside Dam on the Columbia River and to the Brilliant Dam on the Kootenay River up to an elevation of 500 metres." (Study terms of reference, B.C. Hydro) Appendix G. This is the area within which the principal direct environmental impacts would occur. In simplest terms these impacts derive from the replacement of a section of free flowing river with a reservoir (which would be drawn down during Winter and Spring under Operating Regime 1) along with the environmental disruptions associated with the construction and operation of the project. One contribution of the study area to recreation and tourism values is due to this section of the Columbia River being one of the few remaining sections of large free flowing

rivers left in the entire West Kootenay region as the region's hydroelectric potential has been developed. While free flowing, this portion of the Columbia cannot be regarded as natural since its flow is regulated by a series of upstream dams.

While the principal direct environmental impacts would occur within the study area defined above, an assessment of the recreation and tourism impacts must extend beyond the study area. The value of the resource for recreation and tourism depends on the extent to which it offers recreation opportunities which are unique or better than those which can be found elsewhere within a reasonable commute. Thus, the recreational opportunities found within the study area must be compared with opportunities found nearby but outside the study area.

In this report the term "region" is used to indicate this expanded geographic focus. While the relevant area will depend somewhat on the activity being discussed, the term "region" is defined as the Regional Districts of Central Kootenay and Kootenay Boundary. This generally corresponds to the area referred to as the West Kootenays.

A third geographic area specification is used in this report. The area called the "Trail/Castlegar area" encompases Trail, Castlegar, and surrounding communities. This area includes the populations that would be most directly affected by the proposed Murphy Creek project.

Impact of a project can be defined as the difference between future conditions with the project and future conditions without the project. In keeping with this definition this report contains the following sections:

2. The Present Situation
3. Future without the Project
4. Project Characteristics Which May Affect Recreation and Tourism
5. Future with the Project - Impacts
6. Mitigation and Enhancement
7. Summary and Conclusions

2. THE PRESENT SITUATION

Project impacts are determined from a comparison of the future-with-the-project and the future-without-the-project cases. However, only the present situation can be directly observed, and its analysis provides the information base on which projections of the future cases can be constructed.

This section of the report describes

- present natural features and recreational facilities within the study area,
- recreational facilities near the study area, and
- the present levels of recreation use associated with the identified features and facilities.

The following sections will draw on this information in developing projections of future conditions with and without the project.

2.1 INVENTORY OF NATURAL FEATURES

2.1.1 General Overview

In the study area natural vegetation has been greatly modified by land clearing, settlement, agricultural land uses and earlier air pollution from the Cominco smelter at Trail. Generally, however, the remaining natural vegetation reflects the moderately dry climate. Relatively open and aesthetically attractive stands of aspen, Ponderosa pine and Douglas fir predominate on the uplands, especially on south facing slopes and on the valley sides south of Castlegar. Significant treeless areas also occur, mainly in the form of dramatic rock outcrops at higher elevations or small areas of grassland and pasture at lower elevations. Riverine forests typically composed of large cottonwood trees accompanied by a shrubby ground cover are restricted to narrow floodplains adjacent to sections of the Columbia River.

Annual precipitation is approximately 63 centimetres of which about two-thirds occurs in winter in the form of snow. Seasonal snowfall totals average 180 centimetres (Canada Land Inventory Recreation Capability Map Narrative for 82-F). The summer months are relatively warm with the mean daily temperatures in July ranging from 19 to 20 degrees Celseus. A distinct feature of the region is the high frequency of summer storms involving brief thunder showers.

Compared with other recreational opportunities within the West Kootenays, the Columbia River between Hugh Keenleyside Dam and Trail offers moderately significant capability. This is largely a result of the fact that this stretch of river, along with the stretch between Trail and the U.S. border, represents the only section of the free-flowing Columbia in the West Kootenays. Indeed, the Columbia River is predominately comprised of reservoirs for much of its length from near Golden to its mouth on the Pacific Ocean. The major recreational attractions of the Columbia are its viewing potential combined with moderate sport fishing and recreational boating opportunities. (Many rivers in British Columbia are unsuitable for recreational boating.)

Other rivers in southern British Columbia rank higher than the Columbia River from a recreational and visual point of view. The Fraser and Thompson Rivers are visually more dramatic and varied than the Columbia River while several lesser streams throughout the province provide higher sport fishing capability, particularly those rivers supporting an anadromous fishery (e.g., salmon and steelhead).

2.1.2. Methodology for Natural Feature Inventory

Outdoor recreation features such as river bars, beaches, angling opportunities and view sites were evaluated for their recreational significance and identified on maps by a set of

symbols comprised of two parts:

1) letters and numerals which indicate the kind or types of recreation features present, and

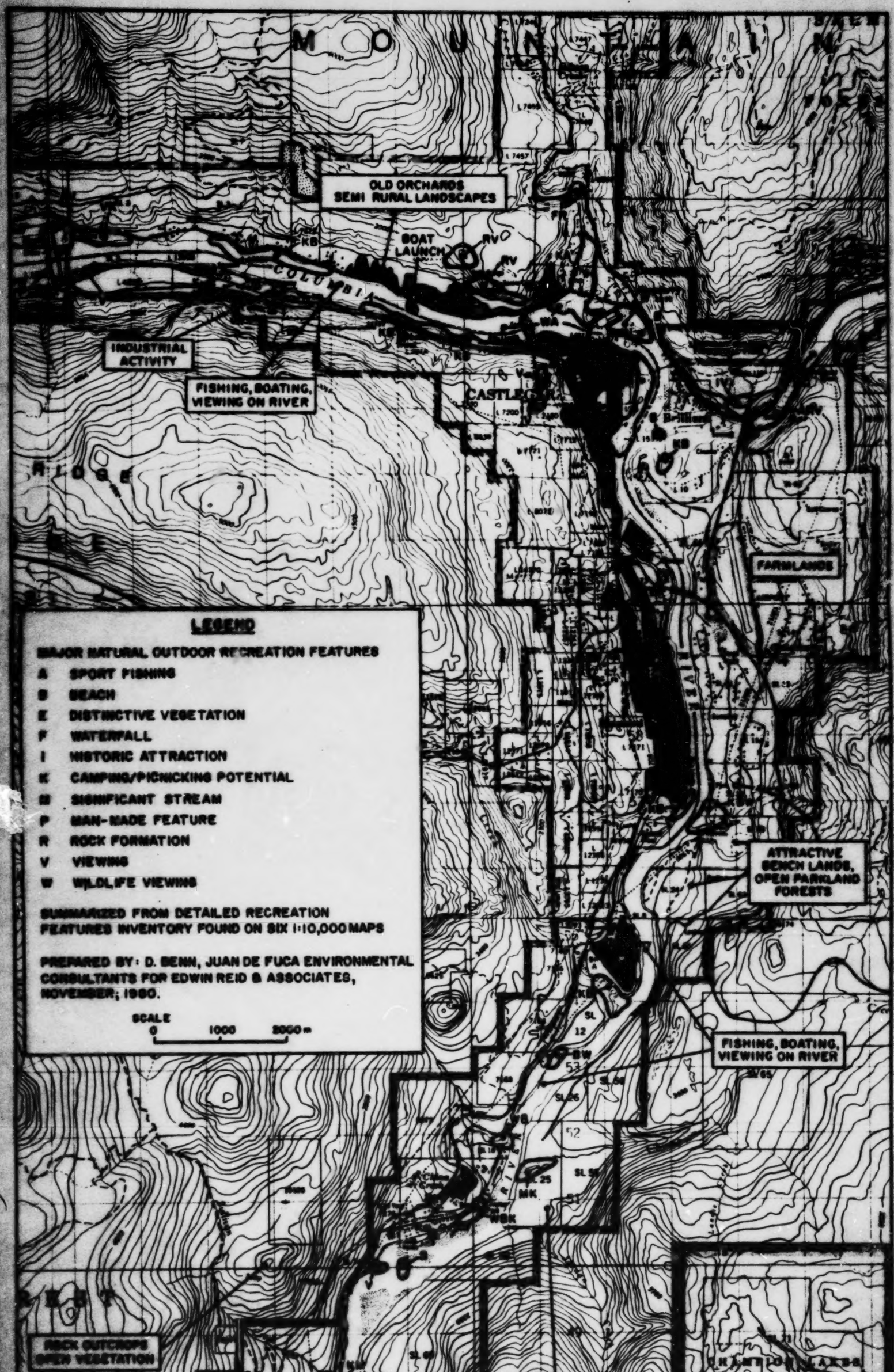
2) plus and minus symbols indicating the relative significance of various areas for outdoor recreation.

Detailed 1:20,000 maps indicating the natural recreation features in the study area are included in the Resource Atlas for the Murphy Creek Project Environmental Studies. A less detailed summary map is included in this report as Figure 2.1. The symbols used are defined in the next section along with summary comments about the significance of each type of feature identified in the study area.

The major source of information for identifying natural recreation features was interpretation of air photographs augmented by a visit to the study area in mid-July of 1980. The methodology closely follows that outlined in the publication "Resource Analysis Unit Inventory of Recreation Capability" which is recognized by the E.L.U.C. Secretariat and other provincial agencies as a standard for outdoor recreation inventories in British Columbia.

2.1.3. Summary of Recreation Features

This section defines each of the symbols used to identify natural recreation features found in the study area and gives a


OLD ORCHARDS
SEMI RURAL LANDSCAPES
BOAT LAUNCH
RV
COLUMBIA
INDUSTRIAL ACTIVITY
FISHING, BOATING, VIEWING ON RIVER
CASTLEGAR
FARMLANDS
ATTRACTIVE BENCH LANDS, OPEN PARKLAND FORESTS
FISHING, BOATING, VIEWING ON RIVER
ROCK OUTCROPS OPEN VEGETATION
LEGEND
MAJOR NATURAL OUTDOOR RECREATION FEATURES
A SPORT FISHING
B BEACH
E DISTINCTIVE VEGETATION
F WATERFALL
I HISTORIC ATTRACTION
K CAMPING/PICNICKING POTENTIAL
M SIGNIFICANT STREAM
P MAN-MADE FEATURE
R ROCK FORMATION
V VIEWING
W WILDLIFE VIEWING
SUMMARIZED FROM DETAILED RECREATION FEATURES INVENTORY FOUND ON SIX 1:10,000 MAPS
PREPARED BY: D. BENN, JUAN DE FUCA ENVIRONMENTAL CONSULTANTS FOR EDWIN REID & ASSOCIATES, NOVEMBER; 1980.
SCALE
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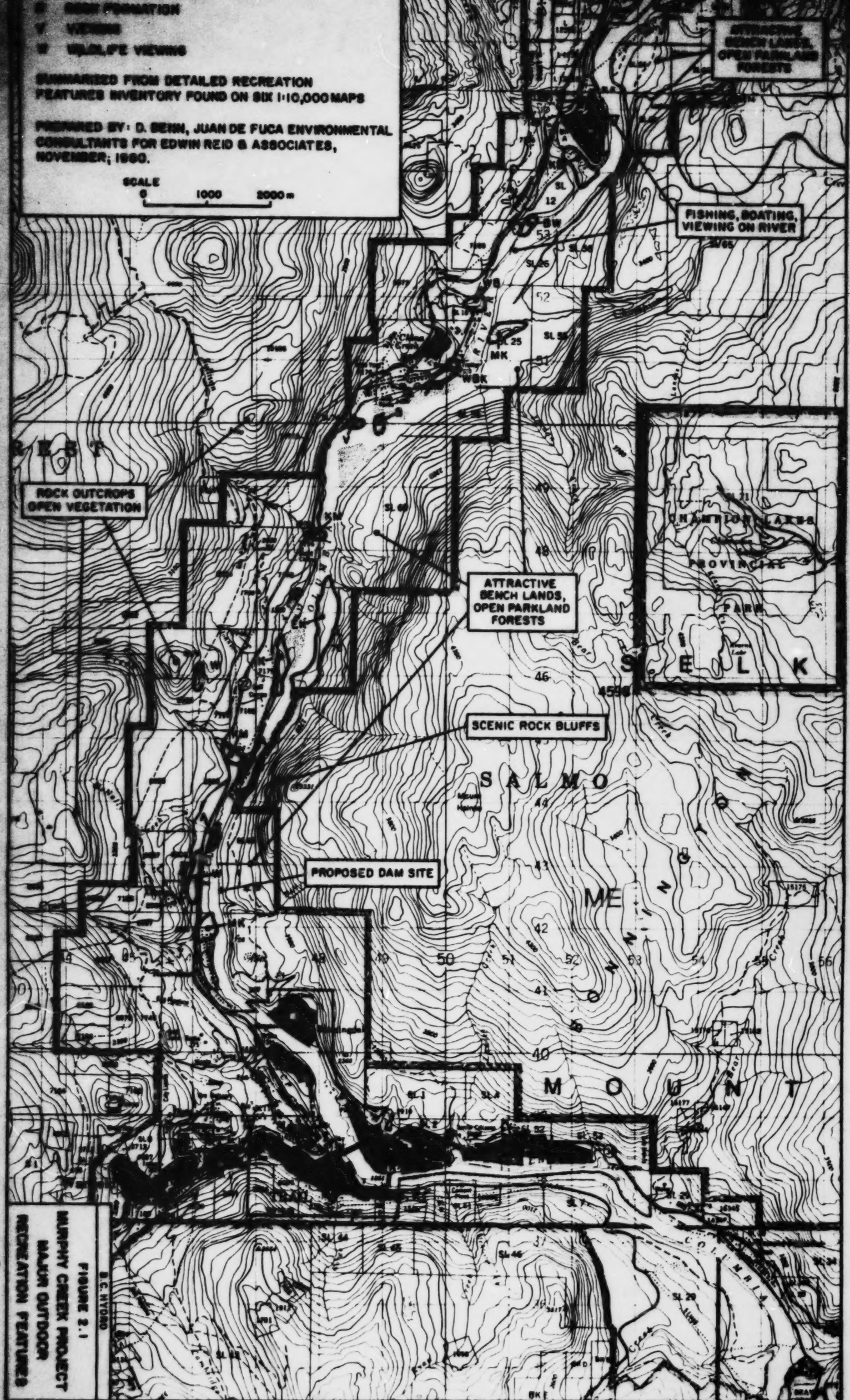
V VIEWING
W WILDLIFE VIEWING
SUMMARIZED FROM DETAILED RECREATION FEATURES INVENTORY FOUND ON SIX 1:10,000 MAPS
PREPARED BY: D. BEHN, JUAN DE FUCA ENVIRONMENTAL CONSULTANTS FOR EDWIN REID & ASSOCIATES, NOVEMBER, 1980.
SCALE
0 1000 2000 m
ATTRACTIVE BENCH LANDS, OPEN PARKLAND FORESTS
FISHING, BOATING, VIEWING ON RIVER
ROCK OUTCROPS OPEN VEGETATION
ATTRACTIVE BENCH LANDS, OPEN PARKLAND FORESTS
SCENIC ROCK BLUFFS
PROPOSED DAM SITE
KAMLOOPS LAKE PROVINCIAL PARK
S E L K
S A L M O
M E N Z O
M O U N T
C O L U M B I A
WEST
B.C. HYDRO
FIGURE 2.1
MURPHY CREEK PROJECT
MAJOR OUTDOOR RECREATION FEATURES

brief summary of the significance of each type of feature in the study area. (The numerals are written as super-scripts in the Resource Atlas.)

A1 SPORT FISHING- Identifies areas suited to angling, primarily rainbow trout, Dolly Varden, kokanee, walleye, and mountain whitefish fishing in the Columbia River and tributary streams. The most significant sport fishing areas are: below Hugh Keenleyside Dam, the lower reaches of the Kootenay River, the mouths of major tributary creeks and certain "holes" and backeddies along the Columbia River such as near Oasis. (See Section 2.5.1 for additional information about fishing in the study area.)

B1 SAND BEACH- Small and relatively infrequent areas of sand beach and river bars found along the Columbia River are highly significant sites for sunbathing, limited swimming, picnicing, and family activities. Sand beaches in the vicinity of Castlegar are especially important in this respect.

B2 GRAVEL BEACH- Gravel bars comprised of stones and cobbles are common along the Columbia River and provide opportunities for river access, walking and fishing.

B3 ROCKY BEACH- Identifies the few instances where river bars are comprised of boulders or angular rocks which have limited recreation potential.

E0 NON-FORESTED AREAS- Identifies certain cleared areas such as hydro transmission rights-of-way where the natural vegetation has been removed.

E4 DECIDUOUS FOREST- Mainly identifies cottonwood and aspen stands along streams and rivers. Such areas are aesthetically appealing and offer opportunities to observe wildlife and appreciate nature.

E5 MIXED FOREST- Identifies mixed coniferous/ deciduous tree cover such as frequently occuring second growth forests on uplands with limited outdoor recreation significance.

E6 OPEN PARKLAND FOREST- This symbol identifies

highly spgnificant open forests (usually aspen, occasionally Ponderosa pine) on benchlands and south to west facing slopes adjacent to the Columbia River. These areas feature a highly attractive landscape for viewing, hiking and riding. When streams or rivers are close-by and where topography and soils are appropriate, these areas are attractive for camping and picnicing.

E7 GRASSLAND/SAVANNA VEGETATION- This symbol significance similar to E6 above but open grasslands and scattered pine form the predominate vegetation cover.

E8 WETLAND VEGETATION- Identifies limited but highly significant marsh and floodplain vegetation featuring excellent opportunities for wildlife observation, nature appreciation and ecological study.

E10 UNIQUE FLORA- Identifies relatively large and attractive individual cottonwood trees at the mouth of Johnson Creek.

F1 WATERFALL- Identifies falls on Pass Creek.

F3 RIVER RAPIDS- Identifies the relatively small and low to moderately significant rapids on the Columbia River such as in the vicinity of the proposed Murphy Creek dam site.

I1 HISTORIC SITE- Identifies major historic sites such as the old bridge at Brilliant.

I2 HISTORIC MONUMENT- Identifies Peter Verigan's tomb as an historic monument.

K DEVELOPMENT POTENTIAL- Identifies sites suitable for development as organized campgrounds or picnic sites. Such areas are highly significant and usually feature: level to gently sloping topography, good soil drainage, proximity to streams or recreational water and adequate tree cover.

L2 FLOODPLAIN LANDFORMS- Identifies extensive areas of floodplain along the Columbia River. The most significant units are found near the mouth of Pass Creek and are in association with the wetland vegetatien and wildlife features.

L6 STEEP SLOPES- Identifies the relatively dramatic escarpments overlooking the Columbia

River or the deeper gulleys associated with tributary streams.

L10 GLACIO-FLUVIAL TERRACE- Identifies significant flat-land terraces overlooking the Columbia River and usually found in association with viewing and open vegetation feature symbols.

M SMALL STREAMS- Identifies small streams and bodies of water of recreational significance such as for picnicing, camping, visual appeal, and wildlife viewing.

Nx RIVER BOATING OPPORTUNITIES- Identifies the Columbia River as a navigable water body suited to recreational boating.

P1 CULTURAL FEATURES- Identifies the Robson-Castlegar Ferry as a cultural feature associated with the West Kootenay Region.

P2 PASTORAL LANDSCAPE- Identifies farmlands which have visual appeal in the region.

P4 MAN-MADE FEATURES- Identifies hydro-electric dams and modern bridges as points of interest.

Q1 MOUNTAINOUS TOPOGRAPHY- Identifies extensive areas of steep, mountainous terrain which borders the study area and which has relatively low recreational significance due to steep slopes, dense vegetation, poor accessibility and a lack of significant attractions.

Q2 HIKING UPLANDS- Identifies attractive benchlands and lower mountain slopes forming terrain suited to hiking, viewing, riding and exploration.

Q3 SHORELAND- Identifies shoreland areas along the Columbia River which are not ideally suited for intensive development such as for camping, but which are aesthetically important in the region.

R1 ROCK FORMATION- Identifies distinctive rock formations and outcrops, especially dramatic rock bluffs overlooking the community of Robson.

V VIEWING- Identifies promontories, ridges and corridors featuring distinctive opportunities for landscape viewing.

W5 UNIQUE WILDLIFE FEATURE- Identifies interesting area of swallow nesting near the mouth of China Creek.

W6 WILDLIFE DIVERSITY- Identifies significant areas for wildlife observation such as at marshes, floodplains and small water bodies.

X BUILT-UP AREAS- Identifies urban and industrial areas with very limited capability for outdoor recreation.

The study area includes substantial areas with low to moderate recreational significance, and a few highly significant features. The most significant features are:

(1) The Columbia River as a fishing, boating, and visual resource, and one of the few remaining sections of free-flowing river in the area.

(2) The Pass Creek area with its water falls, floodplain landforms, fish spawning beds, and park facilities.

(3) The area at and across from the mouth of Johnson Creek (upstream from the Birchbank Golf Course) with its distinctive vegetation and potential for picnic/campground development.

2.2 INVENTORY OF RECREATION FACILITIES

While the study area offers numerous recreational opportunities, relatively few facilities have been developed to facilitate the recreational utilization of these features. The facilities which do exist are indicated on the maps with Z# symbols. They include:

Z1 BOAT LAUNCH RAMP- at Robson

Z2 GOLF COURSE- near Birchbank

Z3 ACCESS POINTS- These are by way of a variety of bridges, roads, and trails used by fishermen, hunters, hikers, wildlife viewers and others.

Z4 HIGHWAYS- These, and Highway 22 in particular, enable the scenic resources of the study area to be enjoyed by a large number of tourists and residents simply by driving through the area.

Z5 AIRPORT- The Castlegar Airport with daily jet service to Vancouver and Calgary is the regional airport and is located within the study area and within one-half hour of the far points of the study area. This provides easy access for tourist and business travelers.

Z6 ACCOMMODATIONS AND SERVICES- The intersection of three major highways combined with the airport make Castlegar the "cross-roads of the West Kootenays". South Castlegar offers extensive motor hotel accomodations (the largest being the High Arrow Arms and the Monte Carlo Motor Inn) as well as automotive and shopping services.

Z7 PASS CREEK PARK- This park offers swimming, hiking, and picnic facilities. A new campground is planned.

Z8 BASEBALL DIAMOND- Located along the waterfront in north Castlegar, this facility is the first component of an extensive waterfront recreation and park development planned for this area.

Z9 COMINCO COMPANY PICNIC AREA- Located near the mouth of Johnson Creek.

Z10 NEIGHBORHOOD PARK- Located in the Dumont subdivision of South Castlegar.

These facilities tend to aim at the logistical requirements of the general traveler rather than direct recreational services such as marinas, campgrounds, and boat launch facilities. However, many of the recreational amenities of the study area appeal to individuals (fishermen, hunters, hikers, etc.) who do not require elaborate facilities for the pursuit of their recreational activities.

2.3 RECREATIONAL ACTIVITY LEVELS

Recreational activities in the study area are engaged in by both residents and tourists. Surveys of both these groups were conducted to determine the extent of recreational activities by different groups, the types and locations of recreational pursuits, the perceived quality of recreational activities in the study area, and the role played by the study area in the overall recreational patterns of the Trail/Castlegar area. This area is characterized by extensive recreational opportunities of which only a portion (see Table 2.11) are located within the study area and subject to direct impact by the proposed Murphy Creek Project.

The following data collection instruments were utilized:

(1) A personal interview survey of residents of Castlegar, Trail and surrounding communities. This survey contacted 800 family units or slightly over seven percent of the 11,000 family units living in the area.

(2) A personal interview survey of tourists traveling through the West Kootenays. These interviews were conducted at two locations (the free highway ferry at Balfour and a service station at the principal highway interchange in South Castlegar) to collect information about the extent of recreational activity in the study area by tourists visiting the West Kootenays.

(3) A creel census conducted by Provincial Fish and Wildlife Branch personnel on the Columbia River between the Hugh Keenleyside Dam and Trail during the period from May to October, 1980.

(4) An interview of fishermen along the Columbia River to determine their fishing patterns, their views on the quality of fishing in the study area, and an indication of the economic value of the fishing opportunity.

(5) An observation program at Pass Creek Park during the summer months to determine the extent of use of that facility.

(6) Discussions with knowledgable individuals in the community. These included elected officials, administrative personnel, avid recreationalists, and businessmen catering to tourists and recreators.

The resultant findings are discussed below followed by an analysis of the recreation activity pattern which emerges.

2.3.1. Recreational Activities by Study Area Residents

To assess the recreational value of the study area we need to know the recreational opportunities the area provides to local residents both in an absolute sense and relative to the other recreational opportunities available to and utilized by residents. A house-to-house interview survey was conducted to obtain this information.

A random sample of households was selected (based on in-service residential electrical meter service) from Castlegar, Trail, Rossland, communities along the West side of the Columbia River, and residential areas surrounding the confluence of the Columbia and Kootenay Rivers (the "Trail/Castlegar area"). The communities included are listed in Appendix A.

A total of 854 households were contacted during the interview process. Of these 300 indicated that they participated in no outdoor recreational activities.* The remaining 554 were asked a series of questions concerning the importance of different recreational activities and the level and location of their outdoor recreational activities. A copy of the questionnaire is included in Appendix A.

The residents of the Trail/Castlegar area tend to be long-time residents (the average residence time was 17.8 years). The average number of persons per household is 2.75. They perceive the principal advantage of living in the area to be the friendly small-town atmosphere as shown in the following summary of responses to a question asking them to indicate up to three advantages:

TABLE 2.1

PERCEIVED ADVANTAGES OF LIVING IN THE TRAIL/CASTLEGAR AREA

ADVANTAGE	% OF TOTAL RESPONSES	RANK
Small town	20	1
Friendly people	19	2
Well paying jobs	12	3
Beautiful scenery	12	4
Good place for children	10	5
Outdoor recreation	9	6
Lots of jobs	7	7
Open country	6	8
Clean air	3	9

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* A similar percentage of non-recreators was encountered in McIntosh & St. Pierre, Liard River Hydroelectric Project Recreation Study. (1980) Preliminary

Outdoor recreation is relatively well down the list in the above tabulation. Its perceived importance is below that of the small-town friendly atmosphere, well paying jobs, being a good environment for children, and having beautiful scenery. While the availability of a rich variety of outdoor recreational opportunities is of primary importance for some of the region's residents, it is a subsidiary consideration for enough other residents that its overall importance to the community as a whole is not dominant. It is also likely that the data presented above are biased in favour of recreational activities since non-recreators were under-represented in the response to this question. The foregoing is not to say that the availability of outdoor recreation opportunities is not important to the area's residents. Rather, it suggests that these opportunities are one of several factors which contribute to the desirability of living in the area and that what is important is the overall balance of factors including jobs, social atmosphere, and recreational opportunities.

To obtain an understanding of which recreational activities were most important to the area's residents, the respondents were asked to indicate, for twelve outdoor recreation activities, "how important that activity is to your family, using a scale of 1 to 5 (where 1= not at all important, 2 = not important, 3 = neutral, 4 = important, and 5 = very important)." The results are presented below in Table 2.2. The table gives the percent

of responses assigned to each importance category and the mean importance rating for each activity.

Table 2.2

IMPORTANCE RATINGS OF RECREATIONAL ACTIVITIES

ACTIVITY	1	2	3	4	5	MEAN	RANK
Sightseeing	42	10	24	18	7	2.40	1
Swimming	50	6	16	17	11	2.34	2
Picnicing	48	9	22	16	5	2.22	3
Fishing	51	8	20	12	9	2.20	4
Skiing, etc.	59	5	11	11	14	2.15	5
Camping	55	7	15	14	8	2.12	6
Wildlife	57	12	19	7	6	1.93	7
Boating	57	13	18	9	5	1.92	8
Hike/climb	60	10	15	11	4	1.89	9
Golfing	64	7	15	7	8	1.87	10
Hunting	75	7	8	5	5	1.59	11
Water skiing	73	8	12	4	3	1.55	12

The most important activities from the point of view of the community as a whole are sightseeing, swimming, and picnicing. These are followed by fishing, winter sports, camping, wildlife viewing, and boating. Hiking/climbing, golfing, hunting, and waterskiing come last according to this tabulation. It is important to remember that these rankings are obtained by averaging across households and therefore reflect both the importance of each activity to those who practise each activity and the relative proportion of the population which engages in each activity. For example, while some residents rate water skiing as being very important to them, since only a small proportion of the population participates in this activity

(relative to swimming or picnicing) it has a low ranking. Every activity had at least three percent of the population which rated that activity as very important. Fishing, while ranked fourth, is rated very important by nearly one-tenth of the population. Winter sports, while ranked fifth, is rated very important by one person out of seven.

Residents were asked how many days members of their household spent on different recreation activities during each season. The results are reported in Table 2.3. Swimming accounted, by far, for the most activity days followed by winter sports, sightseeing, and fishing. The percent of user days occuring each season depends on the activity with 78 percent of swimming days occuring July through September and 69 percent of winter sports days occuring January through March.

TABLE 2.3

ACTIVITY DAYS BY AREA RESIDENTS

ACTIVITY	PERCENT DAYS EACH SEASON Jan-Mar	Apr-Jun	Jul-Sep	Oct-Dec	PERSON DAYS
Fishing	5.3	32.7	47.0	15.0	117208
Boating	2.7	24.5	62.3	10.5	96236
Swimming	1.7	13.6	83.0	1.7	297552
Sightseeing	11.5	25.3	45.5	17.7	155613
Picnicing	.6	21.4	71.0	7.0	118981
Hiking/Climbing	8.7	26.4	41.6	23.2	74510
Wildlife Viewing	12.0	19.9	40.1	28.0	55349
Hunting	1.0	2.3	25.8	70.9	17530
Skiing/Winter Activ.	69.9	2.2	.5	27.3	189627
Golfing	3.1	35.2	48.6	13.1	116026
Camping	.3	16.2	74.1	9.4	106439
Water Skiing	.0	16.0	77.1	6.9	25930
Other	19.1	27.2	28.1	25.5	156181

These estimates of user days were used to calculate participation rates expressed as user days per year per person. The participation rates for different activities by area of residence are presented in Table 2.4. The significantly lower participation rates in area D reflect the high proportion of retired Doukhobor residents in these communities.

TABLE 2.4

PARTICIPATION RATES BY AREA OF RESIDENCE

(ANNUAL USER DAYS PER CAPITA)

	AREA OF RESIDENCE*				
ACTIVITY	A	B	C	D	ALL AREAS
Fishing	5.03	4.04	4.41	1.33	3.97
Boating	3.76	2.62	4.38	2.10	3.26
Swimming	14.39	6.71	12.27	3.50	10.07
Sightseeing	8.28	3.18	6.64	0.50	5.27
Picnicing	5.84	3.59	4.29	0.62	4.03
Hiking/Climbing	4.10	2.16	1.78	0.31	2.52
Wildlife Viewing	3.30	1.21	1.46	0.07	1.87
Hunting	1.00	0.33	0.56	0.11	0.59
Skiing/Winter Activ.	9.22	4.57	7.92	1.69	6.42
Golfing	4.91	2.26	7.30	1.24	3.93
Camping	4.93	2.54	5.05	1.00	3.60
Water Skiing	1.44	0.41	0.96	0.23	0.88
Other	6.91	4.12	4.96	3.61	5.29

Area A: Trail
Area B: Rossland*, Oasis, Rivervale, Genelle, Fairview, Blueberry
Area C: Castlegar (North & South)
Area D: Arrow Lakes, Robson, Raspberry, Pass Creek, Brilliant, Ootischenia, Thrums*, Tarrys*, Glade*, Shore Acres*, Crescent Valley*, South Slocan*

* areas outside the "study area"

2.3.2 Recreation Activities by Tourists

To gain an understanding of the recreation activities in the study area and the West Kootenays by tourists, Edwin, Reid & Associates conducted a personal interview survey of tourists during July and August of 1980. The survey was carried out at two locations:

1) at a gasoline service station located at the highway interchange in South Castlegar, and

2) in the Eastbound waiting line for the Highways Department's free ferry located at Balfour.

The reason for choosing an interview location at Balfour, which is aproximately 100 kilometres from the study area is that tourism is an activity which draws on the recreational resources of an entire region. Furthermore, the value of a particular tourist attraction depends on whether similar attractions are available nearby. Therefore, in order to understand the role of the study area in the region's tourism activity, one must determine the extent to which the study area's recreational amenities are utilized by tourists traveling through the region. The Balfour Ferry is located on one of the principal tourist routes through the West Kootenay region.

Vehicle occupants at the two locations were approached and asked whether they were traveling on holiday and (asked at Balfour) whether they had traveled through either Trail or Castlegar. Individuals who met both of these conditions were asked to

answer the survey questions. The numbers of parties included in the survey are listed in table 2.5.

TABLE 2.5

TOURIST SAMPLE COMPOSITION

Location:	Castlegar Number	%	Balfour Number	%	%
Total approached	163	100	347	100	
Residents	82	50	96	28	
Business travelers	7	4	31	9	
Tourists	75	46	220	63	100
Went through Trail or Castlegar	75	46	71	20	32

Though only about one-third of the holiday travelers approached at Balfour had traveled through Trail or Castlegar, by approaching more individuals a similar sized sample was obtained at each location.

The origins of the tourists passing through Trail or Castlegar were as follows:

TABLE 2.6

ORIGINS OF TOURISTS

Lower Mainland	14%
Rest of B.C.	19
Other Provinces	39
U.S.A.	22
Other Countries	6
	100%

The average visitor is away from home a total of 16.6 days (ranges from 3 to 60 days) and spends 4 days (range of 1 to 26 days) in the West Kootenays. Of these an average of 2.5 days were reportedly spent in the Trail/Castlegar area.

The attractions identified as contributing to the decision to visit this area and their relative mention frequency are:

TABLE 2.7

TOURIST ATTRACTIONS

Attraction	% of mentions
On way to another destination	29
Scenery	25
Visiting friends/relatives	21
Camping spots	16
Boating spots	4
Beaches	4
Fishing spots	1
	100

Thus, half of the mentions concern factors (on way to another destination, and visiting friends/relatives) which are independant of the area's recreational amenities.

Respondents were also asked "What features, if any, detract from your enjoyment of this area?" The twenty responses included these three multiple response items:

TABLE 2.8

TOURIST DETRACTIONS

Item	Responses
Pulp mill	9
Crowded (tourists)	4
All the dams on the Kootenay River	3

Some indication of the economic impact of tourist travel in the region can be inferred from the following data gathered about the average daily expenditure per traveling party on the following categories:

TABLE 2.9

TOURIST EXPENDITURE PATTERNS

Expenditure Category	Daily expenditure per party	%	Tourism B.C. %
Accomodation	$ 8.26	18	19
Meals & refreshments	8.82	19	24
Groceries	5.14	11	9
Gas & oil (auto & boat)	14.13	31	23
Repairs & maintenance	.73	2	
Recreation services	3.06	6	6
Recreational equipment	.50	1	
Other shopping	4.50	10	18
Other	.96	2	
Total	46.10	100	100

Table 2.9 also shows the percentage breakdown of expenditures reported by Tourism B.C. (1981) for comparison. The present survey shows lower expenditures on meals and shopping and higher expenditures on gas and oil. This seems appropriate since the West Kootenays offer fewer shopping and restaurant opportunities and longer distances than urban tourist destinations. The

relatively low cost of accomodation is the result of 87% of visitors either camping or staying with friends.

The average party size is 4.8 composed of two adults, 1.2 children under five years of age and 1.6 children between five and fifteen.

The activities engaged in by the tourists surveyed can be summarized as follows:

TABLE 2.10

SUMMARY OF TOURIST ACTIVITIES

Tourist activity	% of parties participating	average days per party
Sightseeing, picnicing	87	1.68
Swimming	58	1.21
Boating	21	.55
Hot springs	31	.44
Golfing	26	.40
Fishing	26	.37
Historical viewing	36	.36
Hiking, climbing	15	.27
Waterskiing	7	.14

These data suggest that general sightseeing and picnicing is the dominant activity by tourists visiting the area. Swimming is the next most popular activity with over half of visitors to the area participating. The next group of activities (boating, hot springs, golfing, fishing, and historical viewing) is similar both in the percent of tourist parties participating (roughly

one-quarter) and the intensity of participation (averaging about one-half day per party). Hiking/climbing and waterskiing are the activity least frequently engaged in. It is noteworthy that due to the timing of the survey, activities that occur during the fall and winter (e.g. hunting, skiing) were not noted as tourist activities. To avoid double counting, the questionnaire asked for the primary recreation activity for each day. As a result, the results may understate th significance of secondary activities such as wildlife viewing. The location of recreational activities by tourists is examined in the following section.

2.4 THE STUDY AREA AS A LOCATION FOR RECREATIONAL ACTIVITIES

The previous section described the types of recreational activities pursued by residents and tourists in the West Kootenay region and the relative importance of these activities. The role of the study area along the Columbia River between Castlegar and Trail depends on the extent to which that area contains recreational opportunities which are either unavailable or of inferior quality at other nearby locations. To determine this we need an understanding of the present locations where different recreational activities are pursued and the relative quality of different locations. Questions addressing these issues were included in both the resident and tourist surveys.

2.4.1 Location of Resident Recreation Activities

The resident survey asked respondents to indicate how many days they engaged in thirteen outdoor recreation activities at each of the following nine locations:

Rivers:
- #1 Columbia River from Hugh Keenleyside Dam to just north of Rivervale
- #2 Columbia River from Rivervale to U.S. border
- #3 Slocan River

Reservoirs:
- #4 Arrow Lakes Reservoir
- #5 Brilliant Dam Reservoir

Lakes:
- #6 Champion Lake
- #7 Slocan Lake
- #8 Kootenay Lake

- #9 Other locations

The area of impoundment of the proposed Murphy Creek Project reservoir corresponds to location #1, although the study area includes the Columbia River below the proposed dam site at Rivervale down to Trail (a small portion of location #2). Table 2.11 indicates the percent of each activity's total days which were spent at each location.

TABLE 2.11

PERCENT OF ACTIVITY DAYS AT EACH LOCATION

(each row adds to 100%)

	Location #1 Columbia R. to Rivervale	#2 Columbia R. Rivervale to U.S.	#3 Slocan River	#4 Arrow Lakes Reservoir	#5 Brilliant Dam Reservoir	#6 Champion Lake	#7 Slocan Lake	#9 Kootenay Lake	#9 Other Locations
Activity									
fishing	26.3	16.4	2.8	18.1	3.3	2.5	1.4	12.8	16.2
boating	10.6	1.8	.6	33.8	.3	2.1	1.8	20.6	28.4
swimming	5.5	3.1	5.2	14.9	.1	20.0	.6	5.7	44.9
sightsee	12.1	11.5	9.5	12.8	2.3	7.1	6.1	13.4	25.3
picnic	3.6	6.5	2.4	19.4	.1	28.3	3.6	8.0	28.0
hike/clb	23.1	10.4	6.6	5.5	3.2	11.5	10.6	8.2	21.1
wildlife	9.7	9.1	7.2	13.0	4.3	11.2	9.6	3.5	32.4
hunting	14.2	12.9	5.6	3.4	3.6	2.8	7.4	8.2	42.2
skiing	.5	3.1	.2	.0	.0	.1	.1	1.2	94.8
golfing	1.8	.1	)	.0	.0	.0	.0	.1	97.9
camping	1.2	.9	.6	15.7	.0	8.8	4.1	21.2	47.5
wtr ski	.0	.0	.2	30.3	.0	.5	.5	19.2	49.2
other	21.7	10.9	1.3	1.4	.1	.1	.3	.0	64.2

The table indicates that the study area is the most heavily used site for fishing and for hiking/climbing for area residents. For these two activities about one-fourth of all activity days are spent in the study area. The study area is also the most

heavily used single location for hunting, although other locations taken together account for six times as many user days. Significant use of the study area (location #1) also occurs for boating, sightseeing, and wildlife viewing.

Table 2.12 presents the average quality ratings (on a scale of one to five with five being highest quality) of each of the nine locations for each of the activities.

TABLE 2.12

AVERAGE QUALITY RATINGS BY ACTIVITY FOR EACH LOCATION

(5 is highest quality, 1 is lowest)

	Location #1	#2	#3	#4	#5	#6	#7	#9	#9
Activity	Columbia R. to Rivervale	Columbia R. Rivervale to U.S.	Slocan River	Arrow Lakes Reservoir	Brilliant Dam Reservoir	Champion Lake	Slocan Lake	Kootenay Lake	Other Locations
fishing	3.3	3.5	3.9	3.6	3.9	2.9	3.0	3.7	4.0
boating	3.7	3.6	3.9	3.9	--	3.9	3.4	4.4	4.4
swimming	2.8	3.1	4.8	3.9	--	4.0	4.2	3.8	4.2
sightsee	4.3	4.1	4.7	4.2	4.3	4.3	4.5	4.4	4.6
picnic	3.8	4.1	4.8	4.3	--	4.1	4.3	4.4	4.5
hike/clb	4.3	4.2	4.5	4.3	4.6	4.1	4.8	4.7	4.5
wildlife	4.3	3.4	3.8	3.6	4.6	3.4	4.3	4.1	4.2
hunting	3.8	3.2	3.7	3.8	--	3.4	4.7	3.5	3.8

The average quality ratings for four activities are omitted because those activities are so seldom carried out along the river in the study area (as shown in Table 2.11) In addition, ratings are omitted for any cells with less than 5 responses.

A review of Table 2.12 indicates that the study area offers recreational opportunities of a quality comparable to that of opportunities found at other locations in the area. In no case is the indicated quality for the study area (location #1) the highest of the locations shown, although location #1 is certainly rated highest by some respondents. For most activities, excepting wildlife viewing and hunting, the section of the Columbia River below the proposed dam site (location #2) is viewed as offering comparable recreational opportunities.

The respondents were also asked to indicate (1) "the most important features that attract you to using the Columbia River for recreational purposes" and (2) "the main features that detract from your enjoyment of using the Columbia River for recreational purposes." The responses to these questions can be summarized as follows:

TABLE 2.13

ATTRACTIVE AND DETRACTIVE FEATURES OF STUDY AREA

Attractive Features	% of mentions	rank
Close to home	36	1
Scenic beauty	23	2
Ease of access	19	3
Good fishing	14	4
Good boating	4	5
Good camping	3	6
Other	2	7

Detractive Features	% of mentions	rank
Water quality	29	1
Air quality	22	2
Poor facilities	22	3
Poor access	8	4.5
Difficult boating	8	4.5
Crowded facilities	5	6
Other	4	7
Far from home	1	8

The dominant advantage of the study area is its close proximity to the area's population. This close proximity to home will arise again below in the discussion of the sport fishing. On balance, access to the study area's recreation attractions appears to be easy rather than poor, although the available facilities are perceived as deficient. The principal negative factors are the perceived air and water quality problems.

The resident survey also included a question concerning the use of Columbia River tributaries in the study area for recreational purposes. The results are summarized below in the form of the number of mentions of each activity engaged in at each tributary.

TABLE 2.14

TRIBUTARY USE FOR RECREATIONAL ACTIVITIES

Tributary	fish	hike	hunt	swim	stsee	camp	canoe	other
Kootenay River	18	2	2	2	2			4
Pass Creek	11	2	2	16		2		5
Murphy Creek	16	4	7		1			
China Creek	7	7	5	2	2		1	2
Blueberry Creek	9	3	1		1			2
Champion Creek	6	5		4		1		1

The fishing presumably occurs primarily near the mouth of the tributary into the Columbia, although some may occur a little ways upstream. The canoing presumably takes place very close to the Columbia. The other activities can occur anywhere along the tributary where access is possible.

2.4.2 Location of Tourist Recreation Activities

The tourist survey also included questions about where the activities were carried out and the quality of the West Kootenay locations for each activity. The responses to those questions are summarized below. We have indicated whether each location is within or outside the study area along the Columbia River between the Hugh Keenleyside Dam and Trail.

TABLE 2.15

TOURIST RECREATION ACTIVITY LOCATIONS

activity	# mentions	location	in study area
Sightseeing	124	Throughout the area	
Swimming	20	Christina Lake	no
	16	Champion Lake	no
	8	Syringa Creek Park	no
	7	Slocan River	no
	6	Pass Creek Park	yes
	6	Kootenay Lake	no
	6	Arrow Lakes Reservoir	no
	6	Sandspit	no
Boating	14	Christina Lake	no
	10	Arrow Lakes Reservoir	no
	6	Kootenay Lake	no
	2	Columbia River	yes
Hot springs	28	Ainsworth Hot Springs	no
	13	Nakusp Hot Springs	no
Golfing	22	Castlegar Golf Course	yes
	7	Birchbank Golf Course	yes
	7	Nelson Golf Course	no
Fishing	14	Columbia River	yes
	8	Kootenay Lake	no
	7	Arrow Lakes Reservoir	no
	3	Christina Lake	no
	2	Slocan River	no
Historical view	27	Doukhobor Museum	yes
	21	Rossland Museum	no
	2	Kaslo	no
Hiking,climb	10	Kokanee Glacier Park	no
	5	Arrow Lakes Reservoir & Syringa Creek	no
Waterskiing	6	Christina Lake	no
	2	Arrow Lakes Reservoir	no

These data suggests that, with the exception of fishing, the recreational features in the study area play little role in attracting or entertaining tourists. In the case of fishing, the Columbia River presents the dominant opportunity. However,

the preceeding table suggests that fishing is relatively unimportant in attracting tourists to the West Kootenays as compared to other activities both on and off the water.

The ratings of quality can be summarized as follows:

TABLE 2.16

TOURIST RATINGS OF RECREATIONAL QUALITY

Activity	Quality Rating (% responses in each category) bad	poor	ok	good	excellent
Sightseeing	1		2	23	74
Swimming		8	17	26	49
Boating				6	94
Hot springs		13	28	20	39
Golfing			10	38	51
Fishing		13	32	30	26
Historical			2	38	60
Hike/climb		5		9	86
Water skiing				10	90

These data suggest that the West Kootenay region has relatively high quality recreational opportunities with particularly high quality offerings for sightseers, boaters, water skiers and hikers. The perceived quality of the fishing is not as high in this relative sense.

2.5 PARTICULAR RECREATION ACTIVITIES IN THE STUDY AREA

The previous sections describe the composition and locations of recreational activities in the study area and near-by alternative locations. This section takes a closer look at some of the particularly significant recreation activites taking place in the study area. These activities have been identified by various participants as being of particular concern in evaluating the probable impact of the proposed Murphy Creek Project.

2.5.1 Fishing in the Columbia River

Several individuals and groups have expressed a high degree of concern about the possible impact of the proposed Murphy Creek Project on the present and potential sport fishery in the section of the Columbia River between the Hugh Keenleyside Dam and Trail. In response to this concern, several initiatives were undertaken to collect information about this sport fishery. With support from B. C. Hydro, the B. C. Ministry of Environment Fish and Wildlife Branch conducted a creel census along this stretch of the Columbia River during the months of May through October, 1980 and again during March, April and May of 1981. Edwin, Reid & Associates prepared a supplemental questionnaire which was administered to a sample of people fishing along the river by the 1980 creel census interviewers. This information was supplemented by special tabulations of some of the information gathered by the creel census team, interviews

with individuals with extensive fishing experience in the area, and consultations with R.L.& L. Environmental Services Ltd., the fisheries consultant. The results of these information gathering processes are summarized in this section.

The Angler Use and Harvest Report, based on the creel census (Andrusak 1981) reports that "it is difficult to generalize in view of the variety of fish species and seasonal availability. The majority of anglers were found in the first 6-7 km below the (Hugh) Keenleyside Dam ...(and)... tended to seek burbot, Dolly Varden and kokanee in the upper portion of the river whereas rainbow (trout) were sought throughout the entire length of the river."

The rainbow trout fishery accounted for three-fourths (74.7%) of total rod hours, and the creel census revealed that the study area provides an exceptionally high quality rainbow fishing opportunity. The success rate averaged 0.18 fish per rod hour and ranged from 0.05 to 0.49 fish per rod hour. This is "surprisingly high for a river fishery and compares favorable with river steelhead fisheries such as those of the Campbell and Quinsam Rivers ...." (Andrusak 1981) The annual rainbow catch was estimated to be about 2000 fish. The average size "was nearly 1 kg, but the opportunity existed for catching fish to 4 kg in size." The methods employed to catch rainbow trout and the fishing times varied with the season. The most popular spots to catch rainbow were just below the Hugh Keenleyside Dam,

downstream from the Castlegar ferry, and at the mouths of Sullivan and Pass Creeks.

Dolly Varden were second to rainbow trout in terms of effort expended, but provided a much lower success rate (0 to 0.03 fish per hour of effort). The popularity of this fishery just below the Hugh Keenleyside Dam apprears to be a carryover from success in earlier years associated with a now defunct spawning run.

Kokanee fishing is best early in the year when relatively large numbers can be found between the Hugh Keenleyside Dam and the Castlegar ferry. The sampling program by R.L.&L. during the Spring of 1981 showed a significant reduction in kokanee stocks. The long-term implications of this finding are unknown at present. (G. Ash, pers. comm. 1981) Other fish species sought in the study area include burbot (ling), walleye, whitefish, chinook salmon, and brook trout.

One finding which distinguished this area from other sport fisheries is the low average fishing time per angler per day. In most fisheries anglers spend an average of four hours per day. The creel census discovered that the anglers in the study area spent an average of only 1.29 hours per day fishing. The Fish and Wildlife Branch report attributes part of this to problems inherent in attempting to cover such a long stretch of river with a creel census. An alternative explanation is that this is a local fishery where anglers go down to the river after

work or during spare time and fish for a while, rather than a destination for fishermen driving some distance to fish for the day.

Edwin, Reid & Associates tabulated the residences of the anglers included in the creel census during June and July of 1980. The results are reported in Table 2.17.

TABLE 2.17

DISTRIBUTION OF COLUMBIA RIVER ANGLER'S RESIDENCES

Place of residence	June Number	%	July Number	%
Castlegar	37	35	111	40
Trail	20	19	56	20
Rossland	8	8	22	8
Blueberry Creek	2	2	16	6
Ootischenia	12	11	13	5
Crescent Valley	2	2	10	4
Robson	4	4	10	4
Genelle	3	3	8	3
Other local communities	8	8	14	5
Other B.C.	10	9	13	5
Other provinces			4	1
U.S.A.			2	1
	106	100	279	100

This table indicates that this is a local fishery almost to the extreme. Only thirteen percent of the anglers interviewed in the creel census came from outside the immediate local area. Furthermore, anglers from other areas tended to be with local anglers whom they were visiting on holidays.

Another characceristic of the fishery is that it is fished very intensely by a few dedicated anglers. The supplementary questionnaire indicates that the average angler in the study area fishes a total of 57 days per year, and 14 percent indicated that they fished more than 100 days per year. This intensity of effort by local residents is consistent with the relatively short amount of time fished per angler day. Many are apparently dropping down to the river to fish for awhile sometime during the day. Since only a quarter of the anglers are of retirement age (the average age is 49 years), much of the fishing takes place after work.

The Columbia River fishermen interviewed fished according to the following seasonal pattern on the average:

TABLE 2.18

SEASONAL FISHING PATTERNS

	Days	Percent
Winter	3.5	6
Spring	16.6	29
Summer	25.8	45
Fall	11.0	19
	56.9	100

They fish primarily between the Hugh Keenleyside Dam and Rivervale and spend 91 percent of their total fishing time on the Columbia River, with 1 percent spent on other rivers and 8 percent devoted to lake fishing.

The majority of those interviewed thought that the quality of

fishing had changed in recent years, but they were pretty evenly divided as to whether it has gotten better or worse. Half responded to a question about what they would do if the fishing in the area got worse by stating that that they would still fish at this location. Of those who would go elsewhere, one third would seek other river fishing, while two-thirds would turn to lake fishing in the area. The preference for river fishing was indicated by the responses to a question asking "If you had access to a boat at no cost would you prefer lake fishing by boat to river fishing from the shore?" Two-thirds replied that they would prefer the river.

2.5.2 Boating on the Columbia River

The Columbia River as it flows through the valley between Trail and Castlegar is a major river capable of supporting the navigation of recreational and commercial craft up to nine metres or more in length. Pleasure craft have cruised up and down the river between the Grand Coulee Dam and Revelstoke for many years. Indeed, some local boating enthusiasts suggest that this route was more enjoyable before the Arrow Lakes Reservoir was formed by the construction of Hugh Keenleyside Dam because the river level was higher in the spring and less subject to sudden variations, and because log boom debris was not the serious boating hazzard it is today. The Hugh Keenleyside Dam includes navigation locks which are available to both recreational and commercial traffic. The commercial traffic is due almost entirely to the movement of logs from logging areas along the Arrow Lakes Reservoir to the BC Timber Ltd. pulp and lumber mills north of Castlegar just below the dam. Since the Columbia River is a navigable waterway, it is under the purview of the Federal Government in terms of the Navigable Waters Protection Act. In preparation for assessing the impact of the proposed Murphy Creek Project on recreational boating, an understanding of the character of the boating opportunities on the Columbia River, and the degree of utilization of those opportunities is required. This section of the report addresses these two issues. From Castlegar, it is presently possible to travel north as far as Revelstoke, and as far south as the Grand

Coulee Dam at the far end of Roosevelt Lake. Thus the total navigable distance is approximately 500 kilometres. The proposed Murphy Creek Dam would divide this stretch of navigable river nearly in half. The Columbia River below the Grand Coulee Dam is not navigable all the way to the Pacific Ocean. Traveling upstream from the mouth of the Columbia River, one encounters four dams with navigation locks starting with the Bonneville Dam 240 kilometres above the mouth of the river and ending with the McNary Dam 360 kilometres upstream from the river's mouth. The first dam without navigation locks is the Priest Rapids Dam located 680 kilometres above the mouth of the Columbia River. This is the upper physical constraint to river navigation, although the town of Richland, Washington, eighty kilometres to the south, is the practical boundary for navigation on the Columbia since the Hanford Works nuclear waste disposal site just above Richland is a restricted area. Between the Priest Rapids Dam and the Grand Coulee Dam there are five dams on the Columbia without navigation locks.

Those cruising up the Columbia River and wishing to go beyond Richland, Washington, can branch to the Snake River which is navigable as far as Lewiston, Idaho, through the navigation locks of four additional dams. Lewiston is 230 kilometres above the Snake River's confluence with the Columbia just south of Richland, and 965 kilometres upstream from the mouth of the Columbia.

The Yacht Club in Richland confirms the general consensus that boats do not usually attempt to pass the dams on the Columbia upstream from Richland. Those that did would either have to portage or trailer their vessel around the obstructions. The operating staff at the Grand Coulee Dam had no knowledge of boaters trying to pass it, but presumed that trailering arrangements would be the only way possible.

To obtain a measure of the pleasure craft traffic through the Hugh Keenleyside Dam, Edwin, Reid & Associates interviewed the operating personnel, tabulated the log of lock traffic for 1978, and asked the lock operators to collect some supplementary data on the sizes and origin of pleasure craft using the locks during July and August of 1980.

The total reported traffic through the locks in 1978 and peak periods in 1980 is summarized in Table 2.19. That table indicates that pleasure craft traffic accounted for less than ten percent of the total passages through the locks during 1978. The counts for the two peak summer months increased by close to sixty percent between 1978 and 1980. However, even with this increase the average number of pleasure boat passages averaged only 2.6 per day during the peak month.

TABLE 2.19

1978 and 1980 TRAFFIC THROUGH HUGH KEENLEYSIDE LOCKS

Month	1978 Pleasure Craft	1978 Log Rafts	1980 Pleasure Craft
January	2	157	
February	1	127	
March	3	157	
April	3	128	
May	31	151	
June	20	102	
July	39	112	57
August	48	96	80
September	9	112	
October		140	
November	2	129	
December		134	
	158	1545	

The 137 pleasure craft using the locks during July and August, 1980 were 54 percent American and 46 percent Canadian. Their size distribution was as follows:

TABLE 2.20

LENGTH OF PLEASURE CRAFT USING LOCKS

Length	Percent
4.2 metres	3
4.8	21
5.5	21
6.1	10
6.7	9
7.3	26
8.5	5
9.1	5
	100

In addition, lock traffic during August included a group of seven canoes. The daily figures indicate that the pleasure

craft traffic includes a number of cruising groups or flotilla. During August of 1980 these included groups of 12 (Canadian going to Coville, Washington), 5 (American), 6 (American), 8 (American from Coville, Washington), and 7 (American) vessels. The remainder of the traffic consisted of groups of from one to three vessels.

So far, this section has considered the cruiser traffic on the Columbia River. In addition, the river through the study area is utilized by a number of smaller boats engaged in fishing, waterskiing, and general cruising around. During their time on the river the individuals conducting the creel census recorded observations of 2 water skiers, 5 kayaks, 6 canoes, 1 rubber raft, and a raft being used by 4 scuba divers, in addition to a number of cruisers, fishing boats, and run-abouts.

2.5.3 Hunting in the Study Area

Table 2.3 reports that area residents engage in nearly 18,000 person days of hunting per year. Fourteen percent of these days are reported to occur along the Columbia River between Hugh Keenleyside Dam and Rivervale. Of 155 respondants hunting along the Columbia River, 43 (28%) reported that they hunt within 1/4 mile of the river.

Survey respondants reported hunting the following species:

TABLE 2.21

SPECIES HUNTED ALONG COLUMBIA RIVER

SPECIES	MENTIONS	PERCENT
Deer	36	51
Grouse	24	34
Birds	7	10
Bear	2	3
Elk	1	1
Moose	1	1
	71	100

2.5.4 Pass Creek Park

Pass Creek Park is a regional park, administered by the Regional District of Central Kootenay, with picnic and swimming facilities. A $116,000 Federal grant has been approved to add overnight campground facilities. Three swimming ponds are used during warm evenings and weekends. The park is used for a number of group picnics and is filled to capacity during the annual Sun Festival. Individuals who visit the park for these activities have a conception of the park filled with users. A monitoring program carried out by Edwin, Reid & Associates during July and August of 1980 yielded the data summarized in Table 2.22.

As a rough estimate of total useage, one might assume an average of 16 cars per day each staying one-fourth day. This would result in an average of 4 cary being observed at any particular time. Two passengers per car would imply 32 visits per day or 3200 during a season of 100 days. Adding 1800 visits associated with special events gives a total of 5000 visits per year. These assumptions should produce an estimate on the high side of the true value.

TABLE 2.22

PASS CREEK USAGE OBSERVATION DATA

DAY OF WK 1=MON	MO	DATE	HOUR	% CLDS	TEMP (C)	WIND (km)	# CARS
1	7	21	16	0	32	0	10
2	7	22	9	0	18	0	3
3	7	23	14	0	31	0	10
4	7	24	17	0	32	0	7
5	7	25	20	0	21	0	1
6	7	26	17	0	33	0	19
1	7	28	12	0	32	0	2
2	7	29	11	0	25	5	2
3	7	30	15	0	31	0	8
4	7	31	16	0	33	0	9
5	8	1	18	0	32	0	10
6	8	2	21	50	20	0	1
7	8	2	13	0	23	3	4
1	8	4	22	0	18	0	2
3	8	6	13	10	21	0	2
4	8	7	11	1	18	0	2
4	8	7	13	1	24	0	0
4	8	7	17	1	25	0	3
5	8	8	18	10	23	0	1
6	8	9	19	0	22	0	6
7	8	10	13	0	28	0	2
7	8	10	15	0	32	0	4
2	8	12	10	0	21	0	2
3	8	13	11	0	21	0	0
3	8	13	23	0	15	0	2
4	8	14	18	0	31	0	3
5	8	15	20	0	24	0	5
6	8	16	16	70	23	0	2
7	8	17	13	80	20	0	4
1	8	18	11	10	17	0	1
2	8	19	15	0	25	3	3
3	8	20	20	0	25	0	2
4	8	21	18	1	24	0	2
2	8	26	18	0	22	0	3
3	8	27	19	10	18	0	1
AVERAGES:				6.97	24.6	0.32	3.94

3.0 THE FUTURE WITHOUT THE PROJECT

Several changes in the area's recreational patterns will occur without the project which should be taken into account when comparing the with- and without- project cases (i.e., when assessing impacts). This section explores some of the likely changes and presents estimates of future recreation activity levels in case the project does not go ahead.

3.1 RESIDENT RECREATION ACTIVITY

One change with a direct impact on recreation activity levels is population growth. The Socio-Economic Impact consultant, DPA Ltd., (1982) has developed forecasts of the area population based on anticipated growth in employment opportunities. The forecast for the without-project case is summarized in Table 3.1. The forecast calls for a slight reduction in population (associated with a reduction in Cominco Employment after 1982) followed by a relatively stable population level for the remainder of the forecast period.

The population projections also indicate that the age composition is expected to gradually shift toward more over 40 and fewer under 40 years of age. This aging of the population will have some impacts on the amount and type of recreation activities sought.

TABLE 3.1

HISTORICAL AND PROJECTED POPULATION

CASTLEGAR/TRAIL AREA WITHOUT MURPHY CREEK PROJECT

YEAR:	1981	1986	1991	1996	2001
AGE GROUP					
0-14	8,520	7,470	6,930	6,670	6,500
15-39	13,580	13,100	12,570	12,010	11,390
40-64	9,040	8,640	8,810	9,370	10,720
65+	3,760	4,280	4,690	4,970	5,090
TOTAL	34,900	33,500	33,000	33,000	33,700

Source: DPA Murphy Creek Socio-Economic Study, 1982

The total number of recreation days is the product of the size of the population and the number of days per capita for each activity. Present per capita levels, obtained from the resident survey, were reported in Table 2.4. Recreation participation rates have been increasing during recent years due to increases in leisure time, interest in exercise, etc. This trend is expected to continue, subject to eventual saturation. To reflect this trend, we adopted assumptions developed for the Peace Site 'C' Project (Canadian Resourcecon 1979). It is assumed that the per capita days spent engaging in the principal recreation activities would increase at the following rates:

Fishing	4%	Water skiing	3%
Boating	3%	Camping	4%
Swimming	3%	Golfing	4%
Sightseeing	4%	Skiing/Winter Act.	3%
Picnicing	4%	Wildlife Viewing	3%
Hiking/Climbing	3%	Hunting	2%

The 4 percent basic rate of increase comes from the rate at which per capita day visits to Provincial parks increased over 15 years. We also assume that a saturation effect will halt this increase when the days per capita reach twice present levels. This assumption is consistant with the Liard River Recreation study (McIntosh & St. Pierre 1980). The lower rates for activities such as boating, swimming, and hunting reflect the reduction in the proportion of young people who tend to engage in these activities.

The above calculation (population multiplied by participation rate) gives total user days by area residents. The number of resident user days within the study area depends upon the percent of total user days which are spent in the study area. Table 2.11 indicates the distribution of user days across locations. Projections of future recreation user days based on present use patterns, population projections, and trends in participation rates are presented in Table 3.2. The table may contain apparent inaccuracies due to roundoff.

These projections reflect the demand for recreation opportunities. In some cases increases in demand may exceed the capacity of recreation facilities and resources. One area of concern is fishing where the available stocks of fish will be pursued by growing numbers of anglers who will compete for increasingly crowded fishing spots. The concensus seems to be that demand pressures have not yet created difficulties in the

TABLE 3.2

MURPHY CREEK STUDY - USER DAY PROJECTIONS

W/O PROJECT CASE

YEAR:	1981	1988	1993	1996	2001
POPULATION	34900	33300	33000	33000	33700
FISHING					
DAYS/CAPITA 4%	4.1	5.4	6.6	7.4	8.2
TOTAL DEMAND	143090	179820	217800	244200	276340
STUDY AREA %	26.3	26.3	26.3	26.3	26.3
STUDY AREA DAYS	37633	47293	57281	64225	72677
BOATING					
DAYS/CAPITA 3%	3.4	4.2	4.8	5.3	6.1
TOTAL DEMAND	118660	139860	158400	174900	205570
STUDY AREA %	10.6	10.6	10.6	10.6	10.6
STUDY AREA DAYS	12578	14825	16790	18539	21790
SWIMMING					
DAYS/CAPITA 3%	10.4	12.8	14.8	16.2	18.8
TOTAL DEMAND	362960	426240	488400	534600	633560
STUDY AREA %	5.5	5.5	5.5	5.5	5.5
STUDY AREA DAYS	19963	23443	26862	29403	34846
SIGHTSEEING					
DAYS/CAPITA 4%	5.5	7.2	8.8	9.9	11
TOTAL DEMAND	191950	239760	290400	326700	370700
STUDY AREA %	12.1	12.1	12.1	12.1	12.1
STUDY AREA DAYS	23226	29011	35138	39531	44855
PICNICING					
DAYS/CAPITA 4%	4.2	5.5	6.7	7.6	8.4
TOTAL DEMAND	146580	183150	221100	250800	283080
STUDY AREA %	3.6	3.6	3.6	3.6	3.6
STUDY AREA DAYS	5277	6593	7960	9029	10191
HIKING/CLIMBING					
DAYS/CAPITA 3%	2.6	3.2	3.7	4.1	4.7
TOTAL DEMAND	90740	106560	122100	135300	158390
STUDY AREA %	23.1	23.1	23.1	23.1	23.1
STUDY AREA DAYS	20961	24615	28205	31254	36588
WILDLIFE VIEWING					
DAYS/CAPITA 3%	1.9	2.3	2.7	3	3.4
TOTAL DEMAND	66310	76590	89100	99000	114580
STUDY AREA %	9.7	9.7	9.7	9.7	9.7
STUDY AREA DAYS	6432	7429	8643	9603	11114
HUNTING					
DAYS/CAPITA 2%	0.60	0.69	0.76	0.81	0.89
TOTAL DEMAND	21003	23020	25187	26728	30136
STUDY AREA %	14.2	14.2	14.2	14.2	14.2
STUDY AREA DAYS	2982	3269	3576	3795	4279
GOLFING					
DAYS/CAPITA 4%	4.1	5.4	6.6	7.4	8.2
TOTAL DEMAND	143090	179820	217800	244200	276340
STUDY AREA %	1.8	1.8	1.8	1.8	1.8
STUDY AREA DAYS	2576	3237	3920	4396	4974
CAMPING					
DAYS/CAPITA 4%	3.7	4.9	5.9	6.7	7.4
TOTAL DEMAND	129130	163170	194700	221100	249380
STUDY AREA %	1.2	5.00	5.00	5.00	5.00
STUDY AREA DAYS	1550	8159	9735	11055	12469
WATER SKIING					
DAYS/CAPITA 3%	.9	1.1	1.3	1.4	1.6
TOTAL DEMAND	31410	36630	42900	46200	53920
STUDY AREA %	0	0	0	0	0
STUDY AREA DAYS	0	0	0	0	0

study area fishery. (G. Ash and local fishermen, pers. comm. 1981) At some point the pressure will become a problem and either the opportunity to fish will be subject to regulation, or the quality of the fishing will deteriorate.

For many activities, increases in participation will not create congestion problems as long as the growth generates resources to augment the facilities available to recreators. Indeed, some recreation opportunities improve as demand grows and the community adds to its recreation facilities.

Another possible trend is an increased burden on the environment associated with new industrial and residential facilities. One area where this burden may have adverse recreation consequences is the development in the valley above Pass Creek Park. It is possible that continued development may jeopardize the water quality required to sustain the important spawning area in Pass Creek.

3.2 TOURIST RECREATION ACTIVITY

Tourism in B.C. has grown in recent years and is expected to continue to grow at around 1.5 percent per year. (B.C. Tourism, page 26) The user days by tourists are estimated by multiplying the participation rates and study area shares identified in the tourist survey by the growing number of visitor days. The results are reported in Table 3.3. Only those activities which are likely to be affected by the proposed project are included.

TABLE 3.3

ESTIMATED ACTIVITY DAYS BY B.C. RESIDENT TOURISTS

WITHOUT PROJECT CASE

YEAR	1980	1988	1993	1996	2001
TOTAL PARTY DAYS	32625	36752	39592	41401	44600
ACTIVITY					
FISHING					
DAYS/PARTY	0.37	0.37	0.37	0.37	0.37
ACTIVITY DAYS	12071	13598	14649	15318	16502
STUDY AREA %	41	41	41	41	41
DAYS IN AREA	4949	5575	6006	6281	6766
SWIMMING					
DAYS/PARTY	1.21	1.21	1.21	1.21	1.21
ACTIVITY DAYS	39476	44470	47907	50095	53967
STUDY AREA %	8	8	8	8	8
DAYS IN AREA	3158	3558	3833	4008	4317
BOATING					
DAYS/PARTY	0.55	0.55	0.55	0.55	0.55
ACTIVITY DAYS	17944	20214	21776	22770	24530
STUDY AREA %	6	6	6	6	6
DAYS IN AREA	1077	1213	1307	1366	1472
WATER SKIING					
DAYS/PARTY	0.14	0.14	0.14	0.14	0.14
ACTIVITY DAYS	4568	5145	5543	5796	6244
STUDY AREA %	0	0	0	0	0
DAYS IN AREA	0	0	0	0	0

The growth in visitor days was projected at 1.5 percent per year based on projections by Tourism B.C. (1980).

3.3 PLANNED DEVELOPMENTS

Several recreation related developments are planned or proposed during the next few years. These include:

(1) Sandman Inn motor hotel This facility, presently in the final phases of construction will contain 114 rooms. The original plans to have a sports facility including swimming pool, tennis courts, and squash courts have been scaled down. (conversation with J. MacDougal)

(2) Castlegar & District Community Complex An indoor swimming pool has been suggested for this facility, located between North and South Castlegar. It presently includes an arena, kitchen and meeting facilities, tennis courts, and a soccer field.

(3) Castlegar Riverfront Park The city of Castlegar owns land along the river in North Castlegar, which it intends to develop into a riverfront park. Present development consists of a baseball diamond. A drawing was prepared in 1979 depicting a possible marina development at Zuckerberg Island. Development is awaiting the availability of funding. The city hopes to proceed in the near future. (conversations with A. Moore, W. Krug, A. Swetlishoff, and R. Skilling, City of Castlegar)

(4) High Arrow Arms Motor Hotel Expansion A planned 50 room expansion has been put on hold as the hotel has encountered financial difficulties. The hotel has recently changed hands through a tax sale. (A. Swetlishoff, R. Skilling, City of Castlegar)

(5) Proposed Campsite The City of Castlegar desire for a local campground has been met by the proposed campsite development at Pass Creek Park. An eventual campsite as part of the community recreation complex is contemplated. (A. Swetlishoff, R. Skilling)

(6) Best Western Motel Proposal In 1978 a local real estate firm proposed a hotel complex in Ootischenia near the airport. The required rezoning was protested by the local community and rejected by the regional district. A similar proposal may arise in future. (conversation with Floyd Dykeman, Central Kootenay Regional Dist.)

(7) Zuckerberg Island was recently opened as an Historical City Park.

4.0 CHARACTERISTICS OF THE PROPOSED MURPHY CREEK PROJECT WITH POSSIBLE IMPACTS ON RECREATION AND TOURISM

The impact of a project may be defined as the difference between the future-with-project and future-without-project cases, or in simpler terms the things that would be different if the project goes ahead.

Impacts would arise from activities associated with the construction and operation of the project. These activities include a wide range of things including purchase of property, purchase of goods and services, employment, excavation, changes in water flows and levels, etc. These project activities would have both direct and indirect effects on recreation opportunities and values. Direct impacts include such things as flooding out recreation sites. Indirect impacts operate through the effects of project activities on environmental factors (referred to as intervening variables) which in turn affect recreation opportunites and values. An important example would be the effect of project related activities on fish populations which, in turn, affects fishing as a recreational activity. Indirect impacts can occur through complex chains of consequences extending from project activities to recreational factors. For instance, hiring construction workers from outside the area may increase fishing pressure which could reduce fish stocks resulting in loss of recreational value.

The principal characteristics of the proposed Murphy Creek project which are likely to have an impact on recreation and tourism are the excavation, employment, and access alteration associated with the project's construction; changes in water level, flow characteristics, shore length, and surface area associated with the impoundment; and water level fluctuations associated with daily operating patterns and the annual drawdown. These project characteristics would have both direct and indirect (through a variety of intervening variables) effects on recreation factors.

4.1 Excavation - Constructing a hydro-electric facility like the proposed Murphy Creek project involves earth moving. This activity can lead to both changes in the surface features of the area where material is removed or placed and in possible siltation downstream during the excavation process.

4.2 Employment - The project's construction would require the employment of construction workers. While a detailed analysis of the consequences of this workforce is in the domain of an socio-economic impact study, it should be mentioned that a temporary increase in area population can both increase the utilization pressure on available recreation amenities and lead to support activities (e.g. housing) which can have an impact on environmental factors important for recreation and tourism. These factors are not expected to be significant for the Murphy Creek Project.

4.3 Access - The project can either increase or decrease access to recreation features within the study area (or increase access to some features and decrease access to others). Access roads built during construction might be used for recreation access both during and following construction. Besides roads into the dam site, current plans call for only one access road which would be closed once the project was complete.

4.4 Water level - The most obvious impact of a dam is the resulting impoundment. The selection of the El. 424 m level (the lowest of the alternatives considered) has minimized this impact. Although the area covered is minimized by the relatively steep banks, some lands with recreational value would be flooded.

4.5 Water flow - Since the average volume flow would be the same with or without the dam, the larger cross-sectional area of the impoundment implies that the rate of current flow would be lower. However, since the impoundment is relatively narrow in most locations, some observable current would remain. It is estimated that the current would be reduced to between 20 percent and 60 percent of natural-channel velocities near the dam site (B.C. Hydro, 1981).

4.6 Shore length - The impoundment would not only cover up currently exposed land, but would also have a larger shoreline length. This would create the opportunity for more access

points and water front developments.

4.7 Surface area - The larger area of the impoundment, as compared to the present river also would provide greater opportunities for boaters to navigate and a larger visual expanse. This impact has been minimized by the selection of the lower (El. 424 m) level.

4.8 Water level fluctuation - There are two components of fluctuation associated with the Murphy Creek project. The first is the seasonal drawdown which is part of Operating Regime 1. The reservoir level would be drawn down by as much and 10 m from February to May or June. The recreational impact would be negative, but the magnitude of the impact is reduced by its being mostly during the offseason. Operating Regime 2 would be clearly preferable. The second fluctuation component is the daily fluctuation in reservoir under normal operating conditions. It is presently estimated that this fluctuation would be limited to 1.5 m except during March and April when it could reach 2 metres (B.C. Hydro, 1982). Daily fluctuations of this magnitude would have a negative visual impact and would increase the cost and complexity of boat docking and launching facilities.

5.0 FUTURE ACTIVITY WITH THE PROJECT

Section 3 reported projections of resident recreational activity in user days. This section analyses the effects of the project in developing estimates of resident recreation activities in the event the project goes ahead without any mitigation initiatives. These projections can be compared with those of the without-project case for a measure of the project's impact. Mitigation opportunities and their impacts are examined in Section 6.

5.1 Resident Recreation

The number of days residents spend in the study area engaging in a particular recreational activity can be viewed as a function of three determinants: (1) the area population, (2) the activity's participation rate (expressed as days per year per resident), and (3) the percentage share of total user days which are spent within the study region. The proposed Murphy Creek Project would affect all three of these factors. The construction and, to a minor extent, operations workforces would add to the area's population. Changes in the desirability of the study area for various recreational activities would cause residents to increase or decrease the percent of their total activity days they spend in the study area. The addition or loss of recreational opportunities would result in some changes in the participation rates for the affected activities.

The principal recreation activities sensitive to the impact of the Murphy Creek Project are fishing, boating, swimming, water skiing, hiking, and camping. Each of these is discussed below with an estimate of changes in the share of days spent in the study area and the participation rate for each activity. These estimates are used to calculate estimates of the project's impact on user day levels for the different activities. In addition to the "most likely" estimates presented in the text, "optimistic" and "pessimistic" estimates were developed. These are reported in Appendix C.

5.1.1 Fishing - This is perhaps the recreation factor with the most dramatic potential impact. The study area now contains a productive and varied fishery as documented in Section 2.5.1 and in the impact assessment report by R.L.&L. Environmental Services Ltd., the fisheries consultant. As well, it is one of the few remaining large river fisheries in the West Kootenay region.

R.L.&L. conducted a detailed analysis of the impacts of the proposed Murphy Creek project on sport fish in the study region. In their impact assessment report they indicate that withour mitigation or compensation the operational phase of purposed Murphy Creek project would result in

(1) permanent blockage of fish migrations (assuming no fish passage facilities);

(2) loss of riverine habitat;

(3) loss of spawning habitat;

(4) loss of rearing habitat;

(5) the physical, chemical, and biological changes associated with the reservoir and its operation; and

(6) downstream effects.

The implications for sport fish are summarized as follows

(1) Kokanee numbers in the reservoir are expected to be similar to those under the present conditions;

(2) Rainbow trout numbers are expected to decrease substantially;

(3) Mountain whitefish are expected to decrease after impoundment;

(4) Walleye are not expected to establish in the reservoir;

(5) Dolly Varden are expected to occur in the reservoir in low numbers;

(6) Burbot likely would be present in moderate numbers in the reservoir;

(7) Course fish ... would likely exhibit increased populations in the reservoir;

(8) Angler catch rates for kokanee in the reservior will likely be similar to present levels (or decline slightly);

(9) Catch rates for rainbow trout would likely decrease substantially in the reservoir (to perhaps 20% of present success) compared to the present river; and

(10) The sport fishery in the Columbia River near Trail (below the proposed dam site) would (probably) increase substantially during the first few years.

Residents in the Trial/Castlegar area reported 133,400 angler days during 1980. Of this total, 26% or 35,000 days occurred in the study area above the proposed dam site. The rainbow trout fishery accounts for three-fourths of total angler effort with the Dolly Varden fishery second, and the kokanee fishery in

third place. The fishery tends to be a close-to-home, after-work activity with a below average time per angler day. Being a river fishery, success is possible fishing from shore instead of from a boat. This lowers the cost of engaging in the activity.

While the river segment between the Murphy Creek Dam and the U.S. border is equal in length to the segment of river to be replaced by the impoundment, it is estimated that the river segment below the proposed dam contains one large and five smaller fishing sites compared to two large and fifty smaller fishing sites in the segment of river to be replaced by the new reservoir. Fishing sites are generally eddies or pools where the fish prefer to feed. Hence, the decrease in fishing effort is likely to be greater than would be indicated by the percentage reduction in river habitat.

Based on these findings and the R.L.&L. projections, we predict that the percent of total resident angler days spent in the study area would fall from 26% to 12%. While some angler effort would be redirected to other areas, we predict that the 1993 participation rate would decrease from 6.6 days per year per resident to 5.8 days due to the loss of fishing opportunities.

5.1.2 Boating - While fishing suffers the principal loss as a result of the proposed project, boating (both powered and paddled) offers some potential for gain. The new reservoir would offer a somewhat wider expanse for boating as compared to the present river, although boaters valuing the experience of navigating through currents would loose this opportunity above the dam. While there are numerous locations with high quality lake boating opportunities in the West Kootenay region, the new reservoir would be literally in the backyard of the residents of Trail, Castlegar and surrounding communities. Secondly, the closest boating opportunity, on Arrow Lakes Reservoir above the Hugh Keenleyside Dam, experiences some log debris and is subject to large seasonal fluctuations in water levels. The new reservoir should be less subject to log debris (although logs do pass through the Hugh Keenleyside and Brilliant Dams), and the fluctuation problem would be less pronounced during the peak season (although severe during the drawdown season, January-June under reservoir Operating Regime 1. B.C. Hydro is presently undertaking a more detailed assessment of the potential for log derbris in the proposed Murphy Creek reservoir.

The principal negative impact of the project on boating would result from the dam bisecting the 500 kilometre navigation route between the Grand Coulee Dam and Revelstoke. This would be a significant loss in the view of cruising boaters. Possible mitigation of this impact is discussed below in Section 6.

We estimate that the creation of the new reservoir would increase the share of resident boating occuring in the study area from 10.6 percent to 14 percent, and that the participation rate would increase from 4.8 to 4.9 days per year per person.

5.1.3 Swimming - With the selection of the lower (El. 424 m) reservoir level, the important swimming facility at Pass Creek Park should not be negatively affected. The river swimming opportunities along the shore at North Castlegar and at other locations would be changed. The new reservoir would offer swimming opportunities which some might regard as superior to those lost. While some seek opportunities to swim in strong currents, currents pose a safety hazard to most swimmers. The water quality in the new reservoir is expected to be equivalent to that which now prevails in the river. This quality level is acceptable for swimming from a health point of view. The main quality problem is visual resulting from the colour discharge from the BC Timber Ltd. pulp mill. This colour discharge does not pose a health hazard to swimmers although it may impair the quality of the experience due to their perception of it as dirty or unhealthy. The value of the reservoir as a swimming resource would also depend upon access opportunities and lake side park developments. These are discussed further in Section 6.

On balance, we expect the study area's share of swimming and overall participation rates to remain constant.

5.1.4 Water skiing - Following from the above discussions of boating and swimming opportunities, it seems possible that the new reservoir would provide some new water skiing opportunities. One possible benefit is the prospect that the new reservoir may have fewer floating logs which at present pose a hazard to water skiers on Arrow Lakes Reservoir.

We estimate that the study area would attain a 2 percent share of total water skiing (versus zero presently) but that the new opportunity would not change the participation rate of 1.3 days per year per person.

5.1.5 Hiking - While the impoundment would flood areas now utilized for hiking, the project could create new opportunities for hiking and access to additional areas. We estimate that the project would lead to a slight decrease in the study area's share of hiking/climbing activity from 23 percent to 20 percent. However, we predict that this reduction would consist entirely of shifts to other locations so that no change would result in the participation rate.

5.1.6 Scenic viewing - During the summer months, the scenic value of the new reservoir should not be inferior to the vistas presently afforded, although vistas of a substantial free flowing river have been reduced in this area of the Province. During the winter drawdown, there would be a slightly negative visual impact along most of the length of the reservoir.

Certain, relatively site-specific, areas would receive moderate negative impact upon both recreational and visual values as a result of hydro development. Generally, these areas occur where natural riverbank shores are gently sloping and where losses of significant recreational land and shoreline are maximized as a result of local topography. The major areas of anticipated negative impact are:

- lower Pass Creek
- vicinity of Castlegar
- mouth of Kootenay River
- mouth of Blueberry Creek
- mouth of China Creek
- vicinity of Birchbank

As well as loss of natural vegetation and shoreline, drawdown during the early months of the year would expose unvegetated flats at these locations. B.C. Hydro (1981) estimates that these flats would not be covered by silt and mud because 1) reservoir velocities would carry fine particles away, 2) there are few fines in this section of the river as they are trapped by upsteam reservoirs, 3) bank erosion would yield mostly sands and gravels.

As a result of these detrimental factors during drawdown we predict that the quantity of scenic viewing in the study area will decrease from 12.1 percent to 10 percent with a negligible decline in the participation rate below 8.8 days per year per person. The reductions are minor due to the concentration of viewing during the summer months and the tendency to sightsee while in an area for other purposes.

5.1.7 Wildlife Viewing and Hunting - The principal impact here is associated with the loss of habitat due to flooding. There is also concern about the possible loss of nesting locations for some large bird species.

We predict that the area's share of wildlife viewing would decrease slightly from 9.7 percent to 8 percent with a negligible decline in the participation rate below 2.7 days per year per person. The "optimistic" estimate is that no change occurs in area share or participation rates. The "pessimistic" estimate is for reductions to 5 percent and 2.6 days.

The principal hunting impact of the proposed Murphy Creek project would be on deer hunting. The wildlife consultant (Beak 1981) predicts that loss of winter deer habitat would reduce the carrying capacity for 5 - 18 deer. The wildlife consultant suggests that such a small potential change in carrying capacity would be non-detectable in terms of hunter harvest. While these deer generally are not hunted while in the study area, they do rely on winter range within the study area.

In the tables of user days we estimate that the participation rate will decrease from .76 to .74 and the study area share will decline from 14.2 to 13.5 percent.

5.1.8 Camping - Table 2.11 indicates that the study area presently accounts for only 1.2 percent of total camping by area residents. We estimate that the proposed campsite at Pass Creek Park will increase the amount of camping in the study area to 5 percent and the participation rate to 5.9 days.

The campsites proposed for Pass Creek Park are to be located in an area having an elevation of approximately El. 427 metres and therefore should not be affected by flooding. As long as the campground is not affected, the project is not expected to have any impact on camping in the study area.

5.1.9 Picnicing - At the El. 424 metre level, the picnic area at Pass Creek Park should be safe but may be affected by changes in groundwater levels. While some areas along the Castlegar Waterfront would be flooded, these areas have not been developed for picnic use as yet. While the Cominco Company picnic area at Birchbank would be inundated, it is likely the company would choose an alternative site. The project need not jeopardize future picnic development at discussed in Section 6.

In the absence of mitigation we predict that the study area's share of picnic activity would remain constant.

5.2 User Day Projections for Residents

Using the considerations described above, recreation user days with the project without mitigation were estimated. The probable (most likely) estimates of user days are presented in Table 5.1. Table 5.2 reports the estimated differences in user days between the without-project and the with-project cases. The optimistic and pessimistic estimates are reported in Tables C.1 through C.4 in Appendix C.

TABLE 5.1

MURPHY CREEK STUDY - USER DAY ESTIMATES

WITH PROJECT - PROBABLE

YEAR:	1981	1988	1993	1996	2001
POPULATION	34900	33338	33208	33000	33700
FISHING					
DAYS/CAPITA	4.1	5.4	5.8	6.5	7.2
TOTAL DEMAND	143090	180025	192606	214500	242640
STUDY AREA %	26.3	26.3	12	12	12
STUDY AREA DAYS	37633	47347	23113	25740	29117
BOATING					
DAYS/CAPITA	3.4	4.2	4.9	5.4	6.3
TOTAL DEMAND	118660	140020	162719	178200	212310
STUDY AREA %	10.6	10.6	14	14	14
STUDY AREA DAYS	12578	14842	22781	24948	29723
SWIMMING					
DAYS/CAPITA	10.4	12.8	14.8	16.2	18.8
TOTAL DEMAND	362960	426726	491478	534600	633560
STUDY AREA %	5.5	5.5	5.5	5.5	5.5
STUDY AREA DAYS	19963	23470	27031	29403	34846
SIGHTSEEING					
DAYS/CAPITA	5.5	7.2	8.8	9.9	11
TOTAL DEMAND	191950	240034	292230	326700	370700
STUDY AREA %	12.1	12.1	10	10	10
STUDY AREA DAYS	23226	29044	29223	32670	37070
PICNICING					
DAYS/CAPITA	4.2	5.5	6.7	7.6	8.4
TOTAL DEMAND	146580	183359	222494	250800	283080
STUDY AREA %	3.6	3.6	3.6	3.6	3.6
STUDY AREA DAYS	5277	6601	8010	9029	10191
HIKING/CLIMBING					
DAYS/CAPITA	2.6	3.2	3.7	4.1	4.7
TOTAL DEMAND	90740	106682	122870	135300	158390
STUDY AREA %	23.1	23.1	20	20	20
STUDY AREA DAYS	20961	24643	24574	27060	31678
WILDLIFE VIEWING					
DAYS/CAPITA	1.9	2.3	2.7	3	3.4
TOTAL DEMAND	66310	76677	89662	99000	114580
STUDY AREA %	9.7	9.7	8	8	8
STUDY AREA DAYS	6432	7438	7173	7920	9166
HUNTING					
DAYS/CAPITA	0.60	0.69	0.74	0.79	0.87
TOTAL DEMAND	21003	23046	24574	25915	29219
STUDY AREA %	14.2	14.2	13.5	13.5	13.5
STUDY AREA DAYS	2982	3273	3317	3498	3945
GOLFING					
DAYS/CAPITA	4.1	5.4	6.6	7.4	8.2
TOTAL DEMAND	143090	180025	219173	244200	276340
STUDY AREA %	1.8	1.8	1.8	1.8	1.8
STUDY AREA DAYS	2576	3240	3945	4396	4974
CAMPING					
DAYS/CAPITA	3.7	4.9	5.9	6.7	7.4
TOTAL DEMAND	129130	163356	195927	221100	249380
STUDY AREA %	1.2	1.2	5	5	5
STUDY AREA DAYS	1550	1960	9796	11055	12469
WATER SKIING					
DAYS/CAPITA	.9	1.1	1.3	1.4	1.6
TOTAL DEMAND	31410	36672	43170	46200	53920
STUDY AREA %	0	0	2	2	2
STUDY AREA DAYS	0	0	863	924	1078

TABLE 5.2

CHANGES IN USER DAYS DUE TO PROJECT WITHOUT MITIGATION

YEAR:	1981	1988	1993	1996	2001
FISHING					
STUDY AREA	0	54	-34169	-38485	-43561
OTHER AREAS	0	151	8975	8785	9861
TOTAL	0	205	-25194	-29700	-33700
BOATING					
STUDY AREA	0	17	5990	6409	7933
OTHER AREAS	0	143	-1671	-3109	-1193
TOTAL	0	160	4319	3300	6740
SWIMMING					
STUDY AREA	0	27	169	0	0
OTHER AREAS	0	460	2909	0	0
TOTAL	0	486	3078	0	0
SIGHTSEEING					
STUDY AREA	0	33	-5915	-6861	-7785
OTHER AREAS	0	240	7746	6861	7785
TOTAL	0	274	1830	0	0
PICNICING					
STUDY AREA	0	8	50	0	0
OTHER AREAS	0	201	1343	0	0
TOTAL	0	209	1394	0	0
HIKING/CLIMBING					
STUDY AREA	0	28	-3631	-4194	-4910
OTHER AREAS	0	94	4401	4194	4910
TOTAL	0	122	770	0	0
WILDLIFE VIEWING					
STUDY AREA	0	8	-1470	-1683	-1948
OTHER AREAS	0	79	2031	1683	1948
TOTAL	0	87	562	0	0
HUNTING					
STUDY AREA	0	4	-259	-297	-335
OTHER AREAS	0	23	-354	-517	-582
TOTAL	0	26	-613	-813	-917
GOLFING					
STUDY AREA	0	4	25	0	0
OTHER AREAS	0	202	1348	0	0
TOTAL	0	205	1373	0	0
CAMPING					
STUDY AREA	0	-6198	61	0	0
OTHER AREAS	0	6384	1166	0	0
TOTAL	0	186	1227	0	0
WATER SKIING					
STUDY AREA	0	0	863	924	1078
OTHER AREAS	0	42	-593	-924	-1078
TOTAL	0	42	270	0	0

5.3 TOURISM

While tourists traveling by automobile engage in some recreation activities in the West Kootenay region, the evidence presented in Section 2.3.2 suggests that these recreation opportunities have little influence on the decision whether to come to this region on holidays. A majority of tourists pass through either to visit friends or relatives, or while on their way to another destination. In addition, there are numerous locations close to but outside the study area which present comparable sightseeing, swimming, boating, and fishing opportunities. This diversity of activities and opportunities suggests that a reduction of opportunities in the study area would have little impact on the magnitude of tourism in the region.

The new reservoir has the potential for affording new recreation activities. However, the abundance of similar opportunities in the region suggests that this would have little impact on the total volume of tourist traffic. While tourist volumes are not expected to be affected by the project, the location of tourist activity would change in response to changes in opportunities in the study area. Estimated user days (total and within the study area) are presented in Table 5.3. The changes in user days for the with-project case are summarized in Table 5.4.

TABLE 5.3

ESTIMATED ACTIVITY DAYS BY B.C. RESIDENT TOURISTS

WITH PROJECT WITHOUT MITIGATION

YEAR	1980	1988	1993	1996	2001
TOTAL VISITOR DAYS	32625	36752	39592	41401	44600
ACTIVITY					
FISHING					
DAYS/PARTY	0.37	0.37	0.37	0.37	0.37
ACTIVITY DAYS	12071	13598	14649	15318	16502
STUDY AREA %	41	41	14	14	14
DAYS IN AREA	4949	5575	2051	2145	2310
SWIMMING					
DAYS/PARTY	1.21	1.21	1.21	1.21	1.21
ACTIVITY DAYS	39476	44470	47907	50095	53967
STUDY AREA %	8	8	8	8	8
DAYS IN AREA	3158	3558	3833	4008	4317
BOATING					
DAYS/PARTY	0.55	0.55	0.55	0.55	0.55
ACTIVITY DAYS	17944	20214	21776	22770	24530
STUDY AREA %	6	6	8	8	8
DAYS IN AREA	1077	1213	1742	1822	1962
WATER SKIING					
DAYS/PARTY	0.14	0.14	0.14	0.14	0.14
ACTIVITY DAYS	4568	5145	5543	5796	6244
STUDY AREA %	0	0	3	3	3
DAYS IN AREA	0	0	166	174	187

The new reservoir offers the potential for a lake-front destination resort in the Castlegar area. However, the winter drawdown reduces the desirability of such a development, and present and planned Castlegar lodgings are oriented to transportation (highway and airport) rather than recreation features.

TABLE 5.4

ACTIVITY DAYS BY B.C. RESIDENT TOURISTS

CHANGES DUE TO PROJECT WITHOUT MITIGATION

YEAR	1980	1988	1993	1996	2001
ACTIVITY					
FISHING					
STUDY AREA	0	0	-3955	-4136	-4456
OTHER AREAS	0	0	3955	4136	4456
TOTAL	0	0	0	0	0
SWIMMING					
STUDY AREA	0	0	0	0	0
OTHER AREAS	0	0	0	0	0
TOTAL	0	0	0	0	0
BOATING					
STUDY AREA	0	0	436	455	491
OTHER AREAS	0	0	-436	-455	-491
TOTAL	0	0	0	0	0
WATER SKIING					
STUDY AREA	0	0	166	174	187
OTHER AREAS	0	0	-166	-174	-187
TOTAL	0	0	0	0	0

One group of tourists which is likely to be lost as a result of the project are boaters who cruise on the Columbia River between Roosevelt Lake and Revelstoke. The proposed dam will bisect this 500 kilometre navigable waterway unless some provision is made for moving vessels around the dam.

One other possible impact of the project on tourism concerns the possibility of developing the project as a tourist attraction through the provision of vantage points and an information centre. This potential is available during both the

construction and operation phases. This site offers some advantages for this type of development due to its easy access and tourist traffic. While there are numerous hydro-electric projects in the area, little has been done to accommodate tourist interest.

6.0 MITIGATION/COMPENSATION OPPORTUNITIES

The previous section developed estimates of recreational activity levels (in user days) which would be expected if the Murphy Creek Project went ahead. This section examines some possible mitigation, compensation and enhancement options. Each option is described along with its expected impact on the magnitude of user days. The results are summarized in Tables 6.1, 6.2, and 6.3.

These options are offered as examples of the types of initiatives which should be considered for the proposed Murphy Creek Project and to illustrate the likely impact of mitigation/compensation on user day levels. More detailed mitigation/compensation proposals are being developed by the Reservoir Land Management Department at B.C. Hydro.

6.1 FISHING

A range of mitigation/enhancement alternatives are identified and discussed in the fisheries impact report (Ash et al. 1982). The suggestions include an on-site incubation and rearing facility, fish passage facilities, and instream improvements. If implemented, these suggestions would reduce the project's detrimental impact on rainbow trout stocks and enhance kokanee stocks. While this would moderate the reduction in fishing in the study area, a reduction would still be expected since the

character of the fishery would be changed from a river to a lake fishery. We estimate that the study area's share of fishing would partly recover to 18 percent and the participation rate to 6.1 days per year per person.

6.2 BOATING AND WATER SKIING

While the new reservoir would offer the potential of new boating opportunities, appropriate mitigation activities would help to realize this potential.

6.2.1 Access and Boat Facilities

A prerequisite for significant boating use of the proposed reservoir is access and launch facilities. The absence of these factors has prevented the Brilliant Dam reservoir from becomming a significant boating resource.

6.2.2 Reservior Operating Patterns

The quality of the boating opportunites on the new reservoir could be enhanced by minimizing fluctuations in the water level during the full boating season (July through December), filling the reservoir as soon as possible in the spring, and controlling floating log debris. The current engineering plans call for daily water-level fluctuations up to 1.5 m during the boating season (and up to 2 m during March and April). While this would increase the cost of launch and mooring facilities and

would have a negative impact on aquatic resources, it would not jeopardize the reservoir's use for boating. The filling of the proposed Murphy Creek reservior is constrained by the time required to fill the Arrow Lakes to the maximum Murphy Creek elevation. Since the Arrow Lakes Reservoir is a are large storage facility and some of its capacity is reserved for flood control, its filling times are constrained. However, filling the Arrow Lakes and Murphy Creek reservoirs as soon as possible each spring would enhance both fishing and boating. Of course, switching to Operating Regime 2 would eliminate the winter drawdown during most years. Floating logs have been a serious nusiance and hazard for boating and water skiing on the Arrow Lakes. While some free logs get through Hugh Keenleyside Dam, escape from the log handling facilities at BC Timber Ltd and are passed over the Brilliant Dam the problem appears to be less severe below the Hugh Keenleyside Dam than above. Careful log management practices should enable the Murphy Creek reservior to the relatively free from floating logs compared to the Arrow Lakes Reservoir.

6.2.3 Pleasure Boat Passage around the Murphy Creek Dam

Section 2.5.2 documents the cruising boat traffic on the Columbia River. The proposed dam would bisect the 500 km navigable distance between Revelstoke and the Grand Coulee Dam. Possible mitigation options include the construction of navigation locks, a rail transport mechanism across the dam, or the provision of a truck-around service at the dam. Navigation

locks have been estimated to cost more than $30 million (B.C. Hydro, 1983). If we assume annual costs at 10%, this implies 3 million per year or more that $10,000 per pleasure boat passage. Since the maximum length observed passing through the navigation locks at the Hugh Keenleyside Dam during July and August of 1980 was 10 metres, a truck-around service should be feasible. According to the manager of All-Tow Boat Moving Ltd. of Burnaby, it would be possible to operate a one-ton 4-wheel drive pick-up truck together with an "Easy-Load" trailer for this purpose. Approximate cost would be $15,000 for a tuck and $10,000 for a trailer. He estimates that one-half hour per boat would be required for the truck-around. A basic boat launch (which would be located below the dam site) could cost approximately $50,000. One concern of boaters is whether such a service could accommodate groups of boats traveling together without undue delay. Speed could be increased by having two vehicle/trailer units. A truck-around service could be operated in conjunction with a boat launch and mooring facility close to the dam.

An alternate type of move-around facility exists at Sunset Marina located at Lion's Bay. This marina uses an elevator-type device to launch boats which could theoretically be installed on the dam itself. This procedure would be able to move boats in less time although the cost of installation would be considerably higher. Also, this approach requires that pleasure boats be able to approach the dam safely to load and unload.

We estimate that these initiatives would result in the study area accounting for 18 percent of total boating activity by area residents and increasing the participation rate to 5.1 days per year per person. The estimated result for water skiing is an increased study area share of 4 percent and participation rate of 1.3 days per year per person.

6.3 Swimming, Picnicing, Hiking

The development of one or more water-front parks would enhance the study area as a site for these activities. Facilities to be provided could include hiking trails, picnic areas, playgrounds, playing fields, and swimming areas (either reservoir beach areas or shore front pools). The costs of these options would depend on the number and sizes of areas involved, filling and site preparation costs, and type of facilities provided.

The gradual slope along the river at North Castlegar leads to a substantial loss of land area to the reservoir. This land could be reclaimed through landfill. It could also provide an opportunity to use fill to create islands and fingers or peninsulas which would be highly suitable for park development, although its appearance and utilization would be constrained during the drawdown period.

Mr. Rod MacPherson, an architecture student at The Univeristy of British Columbia, has developed a detailed plan for the North Castlegar site incorporating several pools or ponds defined by

fill, boat launch sites, public access with a waterfront walking path, a marina at Zuckerberg Island, an amphitheatre, a recreation centre with an indoor pool, and a nature museum. While this plan was developed for a higher water level than the El. 424 m presently proposed, it illustrates the extent to which a large scale project could enhance the recreation potential of the study area.

It is assumed that the ball field near the gas pipeline crossing in Castlegar would be protected.

We estimate that the provision of additional day-use facilities would affect useage as follows:

ACTIVITY	STUDY AREA SHARE (%)	PARTICIPATION RATE (DAYS)
Swimming	6.5	14.9
Picnicking	5	6.8
Hiking	23	3.7

6.4 Camping

Provided the campsite development at Pass Creek Park is not affected by flooding, no campsite development should be required for mitigation. A future campground development could be planned to enhance the recreational benefits of the project. Such an initiative should be co-ordinated with the City of Castlegar's tentative plans for a campsite as part of their community recreation complex.

6.5 Effect of Mitigation on User Day Levels

The probable effects of the above mitigation initiatives on resident recreation are summarized in Tables 6.1 and 6.2. Table 6.1 shows estimated user days if the project proceeds with mitigation. Table 6.2 presents the differences in resident recreation user days between the without-project and with-project-and-mitigation cases. Optimistic and pessimistic estimates are presented in Tables C-5 through C-8 in Appendix C.

TABLE 6.1

MURPHY CREEK STUDY - USER DAY PROJECTIONS

WITH PROJECT AND MITIGATION/COMPENSATION

YEAR:	1981	1988	1993	1996	2001
POPULATION	34900	33338	33208	33000	33700
FISHING					
DAYS/CAPITA	4.1	5.4	6.1	6.9	7.7
TOTAL DEMAND	143090	180025	202569	227700	259490
STUDY AREA %	26.3	26.3	18	18	18
STUDY AREA DAYS	37633	47347	36462	40986	46708
BOATING					
DAYS/CAPITA	3.4	4.2	5.1	5.6	6.5
TOTAL DEMAND	118660	140020	169361	184800	219050
STUDY AREA %	10.6	10.6	18	18	18
STUDY AREA DAYS	12578	14842	30485	33264	39429
SWIMMING					
DAYS/CAPITA	10.4	12.8	14.9	16.3	18.9
TOTAL DEMAND	362960	426726	494799	537900	636930
STUDY AREA %	5.5	5.5	6.5	6.5	6.5
STUDY AREA DAYS	19963	23470	32162	34964	41400
SIGHTSEEING					
DAYS/CAPITA	5.5	7.2	8.8	9.9	11
TOTAL DEMAND	191950	240034	292230	326700	370700
STUDY AREA %	12.1	12.1	10	10	10
STUDY AREA DAYS	23226	29044	29223	32670	37070
PICNICING					
DAYS/CAPITA	4.2	5.5	6.8	7.6	8.4
TOTAL DEMAND	146580	183359	225814	250800	283080
STUDY AREA %	3.6	3.6	5	5	5
STUDY AREA DAYS	5277	6601	11291	12540	14154
HIKING/CLIMBING					
DAYS/CAPITA	2.6	3.2	3.7	4.1	4.7
TOTAL DEMAND	90740	106682	122870	135300	158390
STUDY AREA %	23.1	23.1	23	23	23
STUDY AREA DAYS	20961	24643	28260	31119	36430
WILDLIFE VIEWING					
DAYS/CAPITA	1.9	2.3	2.7	3	3.4
TOTAL DEMAND	66310	76677	89662	99000	114580
STUDY AREA %	9.7	9.7	8	8	8
STUDY AREA DAYS	6432	7438	7173	7920	9166
HUNTING					
DAYS/CAPITA	0.60	0.69	0.74	0.79	0.87
TOTAL DEMAND	21003	23046	24574	25915	29219
STUDY AREA %	14.2	14.2	13.5	13.5	13.5
STUDY AREA DAYS	2982	3273	3317	3498	3945
GOLFING					
DAYS/CAPITA	4.1	5.4	6.6	7.4	8.2
TOTAL DEMAND	143090	180025	219173	244200	276340
STUDY AREA %	1.8	1.8	1.8	1.8	1.8
STUDY AREA DAYS	2576	3240	3945	4396	4974
CAMPING					
DAYS/CAPITA	3.7	4.9	5.9	6.7	7.4
TOTAL DEMAND	129130	163356	195927	221100	249380
STUDY AREA %	1.2	1.2	5	5	5
STUDY AREA DAYS	1550	1960	9796	11055	12469
WATER SKIING					
DAYS/CAPITA	.9	1.1	1.3	1.4	1.6
TOTAL DEMAND	31410	36672	43170	46200	53920
STUDY AREA %	0	0	4	4	4
STUDY AREA DAYS	0	0	1727	1848	2157

TABLE 6.2

CHANGES IN USER DAYS DUE TO PROJECT WITH MITIGATION/COMPENSATION

YEAR:	1981	1988	1993	1996	2001
FISHING					
STUDY AREA	0	54	-20819	-23239	-25969
OTHER AREAS	0	151	5588	6739	9119
TOTAL	0	205	-15231	-16500	-16850
BOATING					
STUDY AREA	0	17	13695	14725	17639
OTHER AREAS	0	143	-2734	-4825	-4159
TOTAL	0	160	10961	9900	13480
SWIMMING					
STUDY AREA	0	27	5300	5561	6555
OTHER AREAS	0	460	1099	-2261	-3185
TOTAL	0	486	6399	3300	3370
SIGHTSEEING					
STUDY AREA	0	33	-5915	-6861	-7785
OTHER AREAS	0	240	7746	6861	7785
TOTAL	0	274	1830	0	0
PICNICING					
STUDY AREA	0	8	3331	3511	3963
OTHER AREAS	0	201	1383	-3511	-3963
TOTAL	0	209	4714	0	0
HIKING/CLIMBING					
STUDY AREA	0	28	55	-135	-158
OTHER AREAS	0	94	715	135	158
TOTAL	0	122	770	0	0
WILDLIFE VIEWING					
STUDY AREA	0	8	-1470	-1683	-1948
OTHER AREAS	0	79	2031	1683	1948
TOTAL	0	87	562	0	0
HUNTING					
STUDY AREA	0	4	-259	-297	-335
OTHER AREAS	0	23	-354	-517	-582
TOTAL	0	26	-613	-813	-917
GOLFING					
STUDY AREA	0	4	25	0	0
OTHER AREAS	0	202	1348	0	0
TOTAL	0	205	1373	0	0
CAMPING					
STUDY AREA	0	-6198	61	0	0
OTHER AREAS	0	6384	1166	0	0
TOTAL	0	186	1227	0	0
WATER SKIING					
STUDY AREA	0	0	1727	1848	2157
OTHER AREAS	0	42	-1456	-1848	-2157
TOTAL	0	42	270	0	0

TABLE 6.3

ACTIVITY DAYS BY TOURISTS

WITH PROJECT WITH MITIGATION/COMPENSATION

YEAR	1980	1988	1993	1996	2001
TOTAL VISITOR DAYS	32625	36752	39592	41401	44600
ACTIVITY					
FISHING					
DAYS/PARTY	0.37	0.37	0.37	0.37	0.37
ACTIVITY DAYS	12071	13598	14649	15318	16502
STUDY AREA %	41	41	25	25	25
DAYS IN AREA	4949	5575	3662	3830	4126
SWIMMING					
DAYS/PARTY	1.21	1.21	1.21	1.21	1.21
ACTIVITY DAYS	39476	44470	47907	50095	53967
STUDY AREA %	8	8	10	10	10
DAYS IN AREA	3158	3558	4791	5010	5397
BOATING					
DAYS/PARTY	0.55	0.55	0.55	0.55	0.55
ACTIVITY DAYS	17944	20214	21776	22770	24530
STUDY AREA %	6	6	12	12	12
DAYS IN AREA	1077	1213	2613	2732	2944
WATER SKIING					
DAYS/PARTY	0.14	0.14	0.14	0.14	0.14
ACTIVITY DAYS	4568	5145	5543	5796	6244
STUDY AREA %	0	0	5	5	5
DAYS IN AREA	0	0	277	290	312

Tables 6.3 and 6.4 present estimates of tourist user days for the project-with-mitigation case and the differences from the without-project case.

TABLE 6.4

CHANGES IN ACTIVITY DAYS BY TOURISTS

DUE TO PROJECT WITH MITIGATION/COMPENSATION

YEAR	1980	1988	1993	1996	2001
ACTIVITY					
FISHING					
STUDY AREA	0	0	-2344	-2451	-2640
OTHER AREAS	0	0	2344	2451	2640
TOTAL	0	0	0	0	0
SWIMMING					
STUDY AREA	0	0	958	1002	1079
OTHER AREAS	0	0	-958	-1002	-1079
TOTAL	0	0	0	0	0
BOATING					
STUDY AREA	0	0	1307	1366	1472
OTHER AREAS	0	0	-1307	-1366	-1472
TOTAL	0	0	0	0	0
WATER SKIING					
STUDY AREA	0	0	277	290	312
OTHER AREAS	0	0	-277	-290	-312
TOTAL	0	0	0	0	0

7.0 SUMMARY AND CONCLUSIONS

The foregoing sections have presented information about the recreation and tourism patterns in the study area and the region as a whole. The principal conclusions are:

(1) the study area contains a river fishery which is unique and highly productive. This resource is presently used primarily by local residents some of whom fish it intensely. This would be severely damaged by the proposed Murphy Creek Project and constitutes the principal loss from a recreation and tourism standpoint.

(2) The new reservoir, while not as productive as a fishery could offer some new boating, swimming, and waterskiing opportunities.

(3) Protecting the present facilities and the campground in Pass Creek Park from flooding would avoid the necessity of substantial compensation initiatives.

(4) The impact of these losses on actual recreation activity days is cushioned by the abundance of locations for similar activities in the region. As a result, much of the response to the lost opportunities would be a shift of the activity to alternative locations rather than fewer activity days.

(5) The proposed dam would become the only impediment in a 500 km long navigable water way of significant scenic beauty. This is a unique boating experience, although the number of users is not great.

(6) Tourists come to the West Kootenays for a variety of reasons. Non-recreational purposes (i.e., traveling through or visiting friends) account for about half of all visits.

(7) High quality recreational opportunites are available throughout the West Kootenays so that the impairment of amenities in one particular area is unlikely to lead to a measurable reduction in tourist activity.

(8) The study area does provide some recreational opportunities utilized by tourists, particularly for fishermen.

(9) The free-flowing Columbia River between Castlegar and Trail offers one of the few remaining opportunities to observe a major river section in a region with an exceptionally high density of hydro-electric projects (both generation and storage). The contrast of this section of free-flowing river to the series of dams along the Kootenay River is noticed and appreciated by some tourists.

(10) Fisheries mitigation alternatives, as outlined by the fisheries consultant (Ash et al. 1982), should be considered to reduce the principal negative recreation impact of the proposed project.

(11) Some provision should be made for the passage of boats around the proposed dam. Since the volume of traffic is small relative to the costs of a navigation lock, a truck-around service is probably the most appropriate choice. The service should be designed to enable the movement of several boats per hour and should be available on weekends and after normal business hours. This service might be offered in conjunction with a boat access facility located on the new reservoir near the dam.

(12) Boat access facilities would enhance the reservoir's boating potential. Logical sites include just above the dam and at North Castlegar.

(13) Cominco should be encouraged to relocate its picnic facility from Birchbank.

(14) The recreational value of the proposed reservior can be enhanced by maximizing public access. A public walkway around parts of the reservior would meet this objective and provide a unique opportunity for hiking or walking. It would also use and partially disguise berms which are required for slope protection at some locations around the reservoir.

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APPENDIX A

RESIDENT SURVEY

To collect information about the composition, intensity, and location of present recreational activity by residents in the Castlegar/Trail area, Edwin, Reid and Associates conducted a survey of residents based on house-to-house interviews.

The sample was a 10% sample of residences selected by West Kootenay Power & Light from their lists of in-service residential electric meters. The sample consisted of 1074 living units representing a total population of 10,740 living units.

House-to-house interviews were conducted by an experienced local interviewer and by students in the Selkirk College Wildlands Recreation Program.

The distribution of the sample across communities is presented in Table a.1 along with statistics on the number of completed questionnaires and non-recreators in each community.

Non-recreators were individuals who responded that they did not participate in outdoor recreation and, therefore, did not complete the interview. These individuals tended to be retired persons. Since the number of non-recreators and non-respondents varied across the different communities, the sample results were extrapolated to the population using multipliers calculated

TABLE A.1

SAMPLE DISTRIBUTION BY COMMUNITY

CODE	COMUNITY	HSHLDS	SAMPLE	QUEST	%	NO-REC	%	TOTAL	%
1	ROSSLAND	1940	194	82	4.23	112	5.77	194	10.00
2	TRAIL	4360	436	240	5.50	54	1.24	294	6.74
3	OASIS	40	4	3	7.50	1	2.50	4	10.00
4	RIVERVALE	80	8	7	8.75	1	1.25	8	10.00
5	GENEL	140	14	10	7.14	4	2.86	14	10.00
6	CHINA CREEK	60	6	4	6.67	2	3.33	6	10.00
7	FAIRVIEW	50	5	4	8.00	1	2.00	5	10.00
8	BLUEBERRY	270	27	18	6.67	7	2.59	25	9.26
9	SO CASTLEGAR	1170	117	49	4.19	9	0.77	58	4.96
10	NO CASTLEGAR	520	52	26	5.00	7	1.35	33	6.35
11	ARROW LAKES	60	6	4	6.67	2	3.33	6	10.00
12	ROBSON	350	35	14	4.00	21	6.00	35	10.00
13	RASPBERRY	150	15	8	5.33	7	4.67	15	10.00
14	PASS CREEK	190	19	7	3.68	12	6.32	19	10.00
15	BRILLIANT	150	15	11	7.33	4	2.67	15	10.00
16	OOTESCHENIA	200	20	12	6.00	10	5.00	22	11.00
17	THRUMS	210	21	10	4.76	11	5.24	21	10.00
18	TARRYS	130	13	8	6.15	5	3.85	13	10.00
19	GLADE	120	12	7	5.83	5	4.17	12	10.00
20	SHORE ACRES	180	18	9	5.00	9	5.00	18	10.00
21	CRESCENT VLY	190	19	10	5.26	9	4.74	19	10.00
22	SO. SLOCAN	180	18	11	6.11	7	3.89	18	10.00
		10740	1074	554	5.16	300	2.79	854	7.95

separately for four groups of communities with similar response rates.

A copy of the questionnaire is included in this appendix with tabulated results noted for some of the questions. In question 4, concerning the importance of various recreation activities, an adjustment was made for the absence of response from non-recreators. This consisted adding the number of non-recreators to the "not at all important" category. While this adjustment did not affect the relative position of the different activities, it did yield a truer picture of the scale of importance.

Questions 6a and 6b are highly complex and required special tabulation techniques. For question 6a, counts were computed for each activity-season-community combination. The results were then tabulated and presented in Tables 2.3 and 2.4. The responses for question 6b were accumulated by activity-location combinations and the results presented in Tables 2.11 and 2.12

RESIDENT RECREATION SURVEY

Hello. My name is ..... We are conducting a survey of recreation activities of the residents of Castlegar, Trail and surrounding communities. This survey will help in assessing impacts of future developments on recreation in this area. I would like a few minutes to ask you some questions about your household's recreational activities.

1. Where do you live?.....(coded)
   How long has your household lived there?.....17.8.....(years)

2. How many people live in your household?.....2.75.....
   ....1.90.. Adults ..... Children 5 to 15
   .....18.. Children over 15 ..... Children under 5

3. What are the main advantages of living here? (Check no more than 3)

		%		Rank
a.	small town	20.0	☐	1
b.	lots of jobs	6.7	☐	7
c.	friendly people	19.3	☐	2
d.	open country	5.6	☐	8
e.	clean air	2.8	☐	9
f.	outdoor recreation	8.0	☐	6
g.	well paying jobs	12.3	☐	3
h.	good place for children	9.9	☐	5
i.	beautiful scenery	12.3	☐	4
j.	other (specify)	2.4	☐	10

4. For each of the activities listed below, circle one number that indicates how important that activity is to your family, using a scale of 1 to 5 (where 1 = not at all important, 2 = not important, 3 = neutral, 4 = important, 5 = very important).

	not at all important	not important	neutral	important	very important	rank	mean
fishing	1	2	3	4	5	4	2.20
boating	1	2	3	4	5	8	1.92
swimming	1	2	3	4	5	2	2.34
sightseeing	1	2	3	4	5	1	2.40
picnicing	1	2	3	4	5	3	2.22
hiking/climbing	1	2	3	4	5	9	1.89
wildlife viewing	1	2	3	4	5	7	1.93
hunting	1	2	3	4	5	11	1.59
skiing/winter act.	1	2	3	4	5	5	2.15
golfing	1	2	3	4	5	10	1.87
camping	1	2	3	4	5	6	2.12
waterskiing	1	2	3	4	5	12	1.55
other (specify)	1	2	3	4	5		

5. On approximately how many days per season does your family engage in recreational activities in the West Kootenays

		Means
April - June	DAYS	19.5
July - Sept	DAYS	33.4
Oct. - Dec.	DAYS	17.0
Jan. - March	DAYS	18.7

a. On how many days during each season did you engage in each of the following recreational activities? How many members of your household usually accompanied you on these outings?

ACTIVITY	Jan.-Mar.	Apr.-June	July-Sept.	Oct.-Dec.	Total	Number of members of your household
FISHING						
BOATING						
SWIMMING						
SIGHTSEEING						
PICNICING						
HIKING/CLIMBING						
WILDLIFE VIEWING						
HUNTING						
SKIING/WINTER ACTIVITIES						
GOLFING						
CAMPING						
WATERSKIING						
OTHER, (Specify)						

6 b. How many of these activity days were spent at each of the following locations?
We would also like your opinion of the quality (on a scale of 1-5 where 5 is best quality) of each location for that activity.

	RIVERS						RESERVOIRES				LAKES						OTHER LOCATIONS					
	Columbia from Hugh Keenlyside Dam to just north of Riverdale		Columbia from Riverdale to US border		Slocan River		Arrow Lakes		Brilliant Dam Reservoire		Champion		Slocan		Kootenay		Locn. A			Locn. B		
ACTIVITY	Days	Qual	Days	Qual	Days	Qual	Days	Qual	Days	Qual	Days	Qual	Days	Qual	Days	Qual		Days	Qual		Days	Qual
FISHING																						
BOATING																						
SWIMMING																						
SIGHTSEEING																						
PICNICING																						
HIKING/ CLIMBING																						
WILDLIFE VIEWING																						
HUNTING																						
SKIING/ WINTER ACTIVITIES																						
GOLFING																						
CAMPING																						
WATERSKIING																						
OTHER, (Specify)																						

7. Was any of your hunting carried out within 1/4 mile of the Columbia River? Yes 43 (28%) No 112 (72%).

What species did you hunt there?

Deer	36
Grouse	24
Birds	7
Bear	2
Elk	1
Moose	1

8. What are the most important features that attract you to using the Columbia River for recreational purposes? (Check no more than 3)

		%	Rank			%	Rank
a.	close to home	36	1	e.	good boating	4	5
b.	easy access	19	3	f.	good camping	3	6
c.	scenic beauty	23	2	g.	other (specify)	2	7
d.	good fishing	14	4				

9. What, if any, are the main features that detract from your enjoyment of using the Columbia River for recreational purposes? (Check no more than 3)

		%	Rank			%	Rank
a.	poor access	8	4.5	e.	poor facilities	22	3
b.	far from home	1	8	f.	water quality	29	1
c.	crowded facilities	5	6	g.	air quality	22	2
d.	difficult boating conditions	8	4.5	h.	other (specify)	4	7

10. Did you use the tributaries leading into the Columbia River between the Hugh Keenlyside Dam and Trail for recreational purposes in the last year? Yes 142 No 254 (404).

11. If yes, which tributaries did you use and what were your activities (e.g., fishing, hunting, picnicing, sightseeing, etc.)

Tributary	Activity
1. _____	a. _____
	b. _____
	c. _____
2. _____	a. _____
	b. _____
	c. _____

12. Where did you spend your holidays in the last two years?

Locations	Time Period	Main Activities
_____	_____ to _____	_____
_____	_____ to _____	_____
_____	_____ to _____	_____
_____	_____ to _____	_____

13. Is the Head of this household

Over 65 years of age? 28.7% Under 65 years of age? 71.3%

Thank you very much for your participation in this study.

APPENDIX B

TOURIST SURVEY

The sampling characteristics of the survey of tourists is described in the text in Section 2.3.2. A copy of the questionnaire is included in this appendix with a summary of the tabulation on some questions. The descriptive statistics were calculated using the MIDAS statistical package at the University of British Columbia Computing Centre.

WEST KOOTENAY TOURIST SURVEY

Summer, 1980

INTRODUCTION

Hello, my name is _____. I am conducting a survey for Edwin, Reid and Associates Ltd. in Vancouver (give card)

We are interested in the recreational activities of tourists in the West Kootenay area. I would like to ask you a few questions. It will take about 5 minutes.

Interview No. _____ Date ___/___/___ (day)(mo)(yr)

Day of Week _____ Time _____

Interview Location MISS 3/STN 75/FRY 71

Interviewer _____

Q1. Are you travelling on holiday?

Yes 149

No _____ Business _____

Local Inhabitant _____

Other (specify) _____

If no, thank respondent for his/her assistance

Q2. Where is your permanent home?
BC 48/ OTHER PROV 57/ US 33/ OTHER 8/ MISC 3

City _____ State/Province _____

Q3. How many days in total will you be away from home this trip?

Days _____ u = 16.6 range = 3-60

Q4. Of your total time away from home, how many days are you spending in the West Kootenays. (see map)

Days _____ u = 4.0 range = 1-26

Q5. What type(s) of accommodation are you using during your stay in the West Kootenays?

88 Campgrounds for _____ days

17 Hotels, Motels, Resorts, for _____ days

41 Staying with friends/relatives for _____ days

3 Other for _____ days (specify) _____

Q6. How many people are in your party on this trip?

Adults(persons over 15) 2.01

Children (between 5 & 15) 1.64

Children under 5 1.21

4.86 Party Total

Q7. We would like to know what recreational activities you engaged in (or intend to engage in) during your visit to the West Kootenays. For each of the following activities, indicate how many days you and your family engage in each of the following activities. IMPORTANT: Count each day according to your major recreational activity on that day. For example, if you were mainly fishing but happened to be using a boat, count that as a day of fishing not boating.

Days/Party (149)	Number of Days	#of People	Avg. Days
1. Sightseeing, picnicing	250	129	1.94
2. Hiking, climbing	40	22	1.82
3. Swimming	180	86	2.09
4. Boating	82	32	2.56
5. Waterskiing	21	10	2.10
6. Hot Springs	66	46	1.43
7. Wildlife Viewing	1	1	1
8. Fishing	55	38	1.45
9. Golfing	60	39	1.54
10. Historical Viewing	54	53	1.02
11. Horseback Riding			
Total Number of Days			
12. Other	5	2	2.50

Q8. For the activities you checked in Question 7, we would like to know the major location and the quality of each location for that activity.

	Location	Quality
1. Sightseeing, picnicing	_____	Bad/Poor/O.K./Good/Excellent
2. Hiking, Climbing	_____	Bad/Poor/O.K./Good/Excellent
3. Swimming	_____	Bad/Poor/O.K./Good/Excellent
4. Boating	_____	Bad/Poor/O.K./Good/Excellent
5. Waterskiing	_____	Bad/Poor/O.K./Good/Excellent
6. Hot Springs	_____	Bad/Poor/O.K./Good/Excellent
7. Wildlife Viewing	_____	Bad/Poor/O.K./Good/Excellent
8. Fishing	_____	Bad/Poor/O.K./Good/Excellent
9. Golfing	_____	Bad/Poor/O.K./Good/Excellent
10. Historical Viewing	_____	Bad/Poor/O.K./Good/Excellent

Q9. What features contributed to your decision to visit this area? (Check no more than 3).

63	1.	Scenery
0	2.	Historical Sites
1	3.	Close to home
74	4.	On way to another destination
55	5.	Visiting friends/relatives
3	6.	Fishing spots
10	7.	Boating spots
10	8.	Beaches
41	9.	Camping spots
257		
	10.	Other (specify) _____

Q10. What features, if any, detract from your enjoyment of this area? Pulpmill 9/crowded (tourists) 4/ All the dams on the Koot 3/ 1 ea for: low clouds (closed in), price of food, poor highway, traffic, not clean.

Q11. We are particularly interested in recreational use of the area between Castlegar and Trail (area marked in red on map). Did you travel through this area?

Yes _____ No _____

Q12. How many days did you spend in the Trail/Castlegar Area? u=2.5 Range= 1-14 Mostly < 5

Days _____

Q13. Did you drive along Highway 22 between Trail and Castlegar? (map)

Yes _____ No _____

	Tot.	Yes	No
Station	72	36	36
Ferry	69	35	35

IF NO, GO TO QUESTION 15.

Q14. How does the scenery along this stretch compare with other scenery in the West Kootenays?

0	1.	Much less beautiful
1	2.	Less beautiful
35	3.	Similar
35	4.	More beautiful
1	5.	Much more beautiful
72		

Q15. Were there any features along this route (highway 22 between Trail and Castlegar) which you remember in particular as being attractive or unattractive?

No. 50

Yes 20 (specify)

river nicer than lakes 2
sand dunes in river 4
no hydro proj. 3
free flowing river 2
river is very beautiful 2

Q16. Please think back to yesterday and estimate how much money you and your family spent on each of the following items:

Max	Adj.u		means	N.
53	8.26	Accommodation (motels, campsite fees, etc.)	$ 12.44	97
40	14.13	Gas & Oil (automobile and boat)	$ 14.84	139
60	8.82	Meals & Refreshments in Restaurants & Hotels	$ 20.13	64
23	.73	Repairs & Maintenance (auto and boat)	$ 7.07	15
30	3.06	Recreation services (rentals, tours, fees)	$ 7.45	60
50	.50	Recreational equipment	$ 36.50	2
50	4.50	Other shopping (souvenirs)	$ 16.43	40
70	.96	Other (specify) _____	$ 15.56	9
80	5.14	Groc.	34.09	22
139	46.10	Total	$ 46.11	146

Q17. What is your present occupation?

	1.	Homemaker	2	7. Clerical
44	2.	Tradesman	7	8. Technical
13	3.	Agriculture	5	9. Student
18	4.	Labourer	11	10. Retired
35	5.	Professiona/Managerial	1	11. Unemployed
8	6.	Service		12. Other (specify)
			1	Sales
			1	Ins. adj.

Q18. Do you have any general comments on recreation in the West Kootenays.

THANK YOU FOR YOUR COOPERATION. HAVE A NICE DAY.

APPENDIX C

SENSITIVITY ANALYSIS ON USER-DAY PROJECTIONS

Sections 5 and 6 in the text describe the basis for estimates of user days with the project with and without mitigation. Three sets (probable, optimistic, and pessimistic) of estimates for participation rates and study area shares are presented. This appendix presents tables summarizing the user-day estimates corresponding the the optimistic and pessimistic estimates. The probable estimates of user days is given in the text in Tables 5.1, 5.2, 6.1, and 6.2.

TABLE C-1

USEP DAY PROJECTIONS WITH PROJECT WITHOUT MITIGATION

OPTIMISTIC ESTIMATES

YEAR:	1981	1988	1993	1996	2001
POPULATION	34900	33338	33208	33000	33700
FISHING					
DAYS/CAPITA	4.1	5.4	6.2	7	7.8
TOTAL DEMAND	143090	180025	205890	231000	262860
STUDY AREA %	26.3	26.3	15	15	15
STUDY AREA DAYS	37633	47347	30883	34650	39429
BOATING					
DAYS/CAPITA	3.4	4.2	5.1	5.6	6.5
TOTAL DEMAND	118660	140020	169361	184800	219050
STUDY AREA %	10.6	10.6	18	18	18
STUDY AREA DAYS	12578	14842	30485	33264	39429
SWIMMING					
DAYS/CAPITA	10.4	12.8	14.9	16.3	18.9
TOTAL DEMAND	362960	426726	494799	537900	636930
STUDY AREA %	5.5	5.5	7	7	7
STUDY AREA DAYS	19963	23470	34636	37653	44585
SIGHTSEEING					
DAYS/CAPITA	5.5	7.2	8.8	9.9	11
TOTAL DEMAND	191950	240034	292230	326700	370700
STUDY AREA %	12.1	12.1	12.1	12.1	12.1
STUDY AREA DAYS	23226	29044	35360	39531	44855
PICNICING					
DAYS/CAPITA	4.2	5.5	6.7	7.6	8.4
TOTAL DEMAND	146580	183359	222494	250800	283080
STUDY AREA %	3.6	3.6	4	4	4
STUDY AREA DAYS	5277	6601	8900	10032	11323
HIKING/CLIMBING					
DAYS/CAPITA	2.6	3.2	3.7	4.1	4.7
TOTAL DEMAND	90740	106682	122870	135300	158390
STUDY AREA %	23.1	23.1	23.1	23.1	23.1
STUDY AREA DAYS	20961	24643	28383	31254	36588
WILDLIFE VIEWING					
DAYS/CAPITA	1.9	2.3	2.7	3	3.4
TOTAL DEMAND	66310	76677	89662	99000	114580
STUDY AREA %	9.7	9.7	9.7	9.7	9.7
STUDY AREA DAYS	6432	7438	8697	9603	11114
HUNTING					
DAYS/CAPITA	0.60	0.69	0.75	0.80	0.88
TOTAL DEMAND	21003	23046	24906	26265	29614
STUDY AREA %	14.2	14.2	14.2	14.2	14.2
STUDY AREA DAYS	2982	3273	3537	3730	4205
GOLFING					
DAYS/CAPITA	4.1	5.4	6.6	7.4	8.2
TOTAL DEMAND	143090	180025	219173	244200	276340
STUDY AREA %	1.8	1.8	1.8	1.8	1.8
STUDY AREA DAYS	2576	3240	3945	4396	4974
CAMPING					
DAYS/CAPITA	3.7	4.9	6	6.7	7.4
TOTAL DEMAND	129130	163356	199248	221100	249380
STUDY AREA %	1.2	1.2	6	6	6
STUDY AREA DAYS	1550	1960	11935	13266	14963
WATER SKIING					
DAYS/CAPITA	.9	1.1	1.3	1.4	1.6
TOTAL DEMAND	31410	36672	43170	46200	53920
STUDY AREA %	0	0	4	4	4
STUDY AREA DAYS	0	0	1727	1848	2157

TABLE C-2
CHANGES IN USER DAYS DUE TO PROJECT WITHOUT
MITIGATION/COMPENSATION - OPTIMISTIC ESTIMATES

YEAR:	1981	1988	1993	1996	2001
FISHING					
STUDY AREA	0	54	-26398	-29575	-33248
OTHER AREAS	0	151	14488	16375	19768
TOTAL	0	205	-11910	-13200	-13480
BOATING					
STUDY AREA	0	17	13695	14725	17639
OTHER AREAS	0	143	-2734	-4825	-4159
TOTAL	0	160	10961	9900	13480
SWIMMING					
STUDY AREA	0	27	7774	8250	9739
OTHER AREAS	0	460	-1375	-4950	-6369
TOTAL	0	486	6399	3300	3370
SIGHTSEEING					
STUDY AREA	0	33	221	0	0
OTHER AREAS	0	240	1609	0	0
TOTAL	0	274	1830	0	0
PICNICING					
STUDY AREA	0	8	940	1003	1132
OTHER AREAS	0	201	453	-1003	-1132
TOTAL	0	209	1394	0	0
HIKING/CLIMBING					
STUDY AREA	0	28	178	0	0
OTHER AREAS	0	94	592	0	0
TOTAL	0	122	770	0	0
WILDLIFE VIEWING					
STUDY AREA	0	8	54	0	0
OTHER AREAS	0	79	507	0	0
TOTAL	0	87	562	0	0
HUNTING					
STUDY AREA	0	4	-40	-66	-74
OTHER AREAS	0	23	-241	-397	-448
TOTAL	0	26	-281	-463	-522
GOLFING					
STUDY AREA	0	4	25	0	0
OTHER AREAS	0	202	1348	0	0
TOTAL	0	205	1373	0	0
CAMPING					
STUDY AREA	0	-6198	2220	2211	2494
OTHER AREAS	0	6384	2328	-2211	-2494
TOTAL	0	186	4548	0	0
WATER SKIING					
STUDY AREA	0	0	1727	1848	2157
OTHER AREAS	0	42	-1456	-1848	-2157
TOTAL	0	42	270	0	0

TABLE C-3

USER DAY PROJECTIONS WITH PROJECT WITHOUT MITIGATION

PESSIMISTIC ESTIMATES

YEAR:	1981	1988	1993	1996	2001
POPULATION	34900	33338	33208	33000	33700
FISHING					
DAYS/CAPITA	4.1	5.4	5.5	6.2	6.9
TOTAL DEMAND	143090	180025	182644	204600	232530
STUDY AREA %	26.3	26.3	8	8	8
STUDY AREA DAYS	37633	47347	14612	16368	18602
BOATING					
DAYS/CAPITA	3.4	4.2	4.8	5.2	6
TOTAL DEMAND	118660	140020	159398	171600	202200
STUDY AREA %	10.6	10.6	12	12	12
STUDY AREA DAYS	12578	14842	19128	20592	24264
SWIMMING					
DAYS/CAPITA	10.4	12.8	14.6	16	18.5
TOTAL DEMAND	362960	426726	484837	528000	623450
STUDY AREA %	5.5	5.5	4	4	4
STUDY AREA DAYS	19963	23470	19393	21120	24938
SIGHTSEEING					
DAYS/CAPITA	5.5	7.2	8.7	9.8	10.9
TOTAL DEMAND	191950	240034	288910	323400	367330
STUDY AREA %	12.1	12.1	8	8	8
STUDY AREA DAYS	23226	29044	23113	25872	29386
PICNICING					
DAYS/CAPITA	4.2	5.5	6.6	7.6	8.4
TOTAL DEMAND	146580	183359	219173	250800	283080
STUDY AREA %	3.6	3.6	3	3	3
STUDY AREA DAYS	5277	6601	6575	7524	8492
HIKING/CLIMBING					
DAYS/CAPITA	2.6	3.2	3.5	4.1	4.7
TOTAL DEMAND	90740	106682	116228	135300	158390
STUDY AREA %	23.1	23.1	10	10	10
STUDY AREA DAYS	20961	24643	11623	13530	15839
WILDLIFE VIEWING					
DAYS/CAPITA	1.9	2.3	2.6	2.8	3.4
TOTAL DEMAND	66310	76677	86341	92400	114580
STUDY AREA %	9.7	9.7	5	5	5
STUDY AREA DAYS	6432	7438	4317	4620	5729
HUNTING					
DAYS/CAPITA	0.60	0.69	0.73	0.77	0.86
TOTAL DEMAND	21003	23046	24242	25565	28824
STUDY AREA %	14.2	14.2	12	12	12
STUDY AREA DAYS	2982	3273	2909	3068	3459
GOLFING					
DAYS/CAPITA	4.1	5.4	6.6	7.4	8.2
TOTAL DEMAND	143090	180025	219173	244200	276340
STUDY AREA %	1.8	1.8	1.8	1.8	1.8
STUDY AREA DAYS	2576	3240	3945	4396	4974
CAMPING					
DAYS/CAPITA	3.7	4.9	5.8	6.7	7.4
TOTAL DEMAND	129130	163356	192606	221100	249380
STUDY AREA %	1.2	1.2	0	0	0
STUDY AREA DAYS	1550	1960	0	0	0
WATER SKIING					
DAYS/CAPITA	.9	1.1	1.3	1.4	1.6
TOTAL DEMAND	31410	36672	43170	46200	53920
STUDY AREA %	0	0	0	0	0
STUDY AREA DAYS	0	0	0	0	0

TABLE C-4
CHANGES IN USER DAYS DUE TO PROJECT WITHOUT
MITIGATION/COMPENSATION - PESSIMISTIC ESTIMATES

YEAR:	1981	1988	1993	1996	2001
FISHING					
STUDY AREA	0	54	-42670	-47857	-54075
OTHER AREAS	0	151	7514	8257	10265
TOTAL	0	205	-35156	-39600	-43810
BOATING					
STUDY AREA	0	17	2337	2053	2474
OTHER AREAS	0	143	-1339	-5353	-5844
TOTAL	0	160	998	-3300	-3370
SWIMMING					
STUDY AREA	0	27	-7469	-8283	-9908
OTHER AREAS	0	460	3905	1683	-202
TOTAL	0	486	-3563	-6600	-10110
SIGHTSEEING					
STUDY AREA	0	33	-12026	-13659	-15468
OTHER AREAS	0	240	10535	10359	12098
TOTAL	0	274	-1490	-3300	-3370
PICNICING					
STUDY AREA	0	8	-1384	-1505	-1698
OTHER AREAS	0	201	-543	1505	1698
TOTAL	0	209	-1927	0	0
HIKING/CLIMBING					
STUDY AREA	0	28	-16582	-17724	-20749
OTHER AREAS	0	94	10710	17724	20749
TOTAL	0	122	-5872	0	0
WILDLIFE VIEWING					
STUDY AREA	0	8	-4326	-4983	-5385
OTHER AREAS	0	79	1566	-1617	5385
TOTAL	0	87	-2759	-6600	0
HUNTING					
STUDY AREA	0	4	-667	-728	-820
OTHER AREAS	0	23	-277	-436	-492
TOTAL	0	26	-945	-1164	-1312
GOLFING					
STUDY AREA	0	4	25	0	0
OTHER AREAS	0	202	1348	0	0
TOTAL	0	205	1373	0	0
CAMPING					
STUDY AREA	0	-6198	-9735	-11055	-12469
OTHER AREAS	0	6384	7641	11055	12469
TOTAL	0	186	-2094	0	0
WATER SKIING					
STUDY AREA	0	0	0	0	0
OTHER AREAS	0	42	270	0	0
TOTAL	0	42	270	0	0

TABLE C-5

USEP DAY PROJECTIONS WITH PROJECT WITH MITIGATION/COMPENSATION

OPTIMISTIC ESTIMATES

YEAR:	1981	1988	1993	1996	2001
POPULATION	34900	33338	33208	33000	33700
FISHING					
DAYS/CAPITA	4.1	5.4	6.4	7.2	8
TOTAL DEMAND	143090	180025	212531	237600	269600
STUDY AREA %	26.3	26.3	22	22	22
STUDY AREA DAYS	37633	47347	46757	52272	59312
BOATING					
DAYS/CAPITA	3.4	4.2	5.6	6.1	7.1
TOTAL DEMAND	118660	140020	185965	201300	239270
STUDY AREA %	10.6	10.6	25	25	25
STUDY AREA DAYS	12578	14842	46491	50325	59818
SWIMMING					
DAYS/CAPITA	10.4	12.8	15.2	16.6	19.2
TOTAL DEMAND	362960	426726	504762	547800	647040
STUDY AREA %	5.5	5.5	8	8	8
STUDY AREA DAYS	19963	23470	40381	43824	51763
SIGHTSEEING					
DAYS/CAPITA	5.5	7.2	8.8	9.9	11
TOTAL DEMAND	191950	240034	292230	326700	370700
STUDY AREA %	12.1	12.1	12.1	12.1	12.1
STUDY AREA DAYS	23226	29044	35360	39531	44855
PICNICING					
DAYS/CAPITA	4.2	5.5	6.9	7.6	8.4
TOTAL DEMAND	146580	183359	229135	250800	283080
STUDY AREA %	3.6	3.6	8	8	8
STUDY AREA DAYS	5277	6601	18331	20064	22646
HIKING/CLIMBING					
DAYS/CAPITA	2.6	3.2	3.7	4.1	4.7
TOTAL DEMAND	90740	106682	122870	135300	158390
STUDY AREA %	23.1	23.1	27	27	27
STUDY AREA DAYS	20961	24643	33175	36531	42765
WILDLIFE VIEWING					
DAYS/CAPITA	1.9	2.3	2.7	3	3.4
TOTAL DEMAND	66310	76677	89662	99000	114580
STUDY AREA %	9.7	9.7	9.7	9.7	9.7
STUDY AREA DAYS	6432	7438	8697	9603	11114
HUNTING					
DAYS/CAPITA	0.60	0.69	0.75	0.80	0.88
TOTAL DEMAND	21003	23046	24906	26265	29614
STUDY AREA %	14.2	14.2	14.2	14.2	14.2
STUDY AREA DAYS	2982	3273	3537	3730	4205
GOLFING					
DAYS/CAPITA	4.1	5.4	6.6	7.4	8.2
TOTAL DEMAND	143090	180025	219173	244200	276340
STUDY AREA %	1.8	1.8	1.8	1.8	1.8
STUDY AREA DAYS	2576	3240	3945	4396	4974
CAMPING					
DAYS/CAPITA	3.7	4.9	6	6.7	7.4
TOTAL DEMAND	129130	163356	199248	221100	249380
STUDY AREA %	1.2	1.2	6	6	6
STUDY AREA DAYS	1550	1960	11955	13266	14963
WATER SKIING					
DAYS/CAPITA	.9	1.1	1.4	1.5	1.7
TOTAL DEMAND	31410	36672	46491	49500	57290
STUDY AREA %	0	0	6	6	6
STUDY AREA DAYS	0	0	2789	2970	3437

TABLE C-6
CHANGES IN USER DAYS DUE TO PROJECT WITH
MITIGATION/COMPENSATION - OPTIMISTIC ESTIMATES

YEAR:	1981	1988	1993	1996	2001
FISHING					
STUDY AREA	0	54	-10525	-11953	-13365
OTHER AREAS	0	151	5256	5353	6625
TOTAL	0	205	-5269	-6600	-6740
BOATING					
STUDY AREA	0	17	29701	31786	38027
OTHER AREAS	0	143	-2136	-5386	-4327
TOTAL	0	160	27565	26400	33700
SWIMMING					
STUDY AREA	0	27	13519	14421	16917
OTHER AREAS	0	460	2843	-1221	-3437
TOTAL	0	486	16362	13200	13480
SIGHTSEEING					
STUDY AREA	0	33	221	0	0
OTHER AREAS	0	240	1609	0	0
TOTAL	0	274	1830	0	0
PICNICING					
STUDY AREA	0	8	10371	11035	12456
OTHER AREAS	0	201	-2336	-11035	-12456
TOTAL	0	209	8035	0	0
HIKING/CLIMBING					
STUDY AREA	0	28	4970	5277	6177
OTHER AREAS	0	94	-4200	-5277	-6177
TOTAL	0	122	770	0	0
WILDLIFE VIEWING					
STUDY AREA	0	8	54	0	0
OTHER AREAS	0	79	507	0	0
TOTAL	0	87	562	0	0
HUNTING					
STUDY AREA	0	4	-40	-66	-74
OTHER AREAS	0	23	-241	-397	-448
TOTAL	0	26	-281	-463	-522
GOLFING					
STUDY AREA	0	4	25	0	0
OTHER AREAS	0	202	1348	0	0
TOTAL	0	205	1373	0	0
CAMPING					
STUDY AREA	0	-6198	2220	2211	2494
OTHER AREAS	0	6384	2328	-2211	-2494
TOTAL	0	186	4548	0	0
WATER SKIING					
STUDY AREA	0	0	2789	2970	3437
OTHER AREAS	0	42	802	330	-67
TOTAL	0	42	3591	3300	3370

TABLE C-7

USEP DAY PROJECTIONS WITH PROJECT WITH MITIGATION/COMPENSATION

PESSIMISTIC ESTIMATES

YEAR:	1981	1988	1993	1996	2001
POPULATION	34900	33338	33208	33000	33700
FISHING					
DAYS/CAPITA	4.1	5.4	5.7	6.4	7.1
TOTAL DEMAND	143090	180025	189286	211200	239270
STUDY AREA %	26.3	26.3	10	10	10
STUDY AREA DAYS	37633	47347	18929	21120	23927
BOATING					
DAYS/CAPITA	3.4	4.2	4.9	5.4	6.3
TOTAL DEMAND	118660	140020	162719	178200	212310
STUDY AREA %	10.6	10.6	15	15	15
STUDY AREA DAYS	12578	14842	24408	26730	31847
SWIMMING					
DAYS/CAPITA	10.4	12.8	14.7	16.1	18.7
TOTAL DEMAND	362960	426726	488158	531300	630190
STUDY AREA %	5.5	5.5	5	5	5
STUDY AREA DAYS	19963	23470	24408	26565	31510
SIGHTSEEING					
DAYS/CAPITA	5.5	7.2	8.7	9.8	10.9
TOTAL DEMAND	191950	240034	288910	323400	367330
STUDY AREA %	12.1	12.1	8	8	8
STUDY AREA DAYS	23226	29044	23113	25872	29386
PICNICING					
DAYS/CAPITA	4.2	5.5	6.7	7.6	8.4
TOTAL DEMAND	146580	183359	222494	250800	283080
STUDY AREA %	3.6	3.6	4	4	4
STUDY AREA DAYS	5277	6601	8900	10032	11323
HIKING/CLIMBING					
DAYS/CAPITA	2.6	3.2	3.6	4.1	4.7
TOTAL DEMAND	90740	106682	119549	135300	158390
STUDY AREA %	23.1	23.1	20	20	20
STUDY AREA DAYS	20961	24643	23910	27060	31678
WILDLIFE VIEWING					
DAYS/CAPITA	1.9	2.3	2.6	2.8	3.4
TOTAL DEMAND	66310	76677	86341	92400	114580
STUDY AREA %	9.7	9.7	5	5	5
STUDY AREA DAYS	6432	7438	4317	4620	5729
HUNTING					
DAYS/CAPITA	0.60	0.69	0.73	0.77	0.86
TOTAL DEMAND	21003	23046	24242	25565	28824
STUDY AREA %	14.2	14.2	12	12	12
STUDY AREA DAYS	2982	3273	2909	3068	3459
GOLFING					
DAYS/CAPITA	4.1	5.4	6.6	7.4	8.2
TOTAL DEMAND	143090	180025	219173	244200	276340
STUDY AREA %	1.8	1.8	1.8	1.8	1.8
STUDY AREA DAYS	2576	3240	3945	4396	4974
CAMPING					
DAYS/CAPITA	3.7	4.9	5.8	6.7	7.4
TOTAL DEMAND	129130	163356	192606	221100	249380
STUDY AREA %	1.2	1.2	0	0	0
STUDY AREA DAYS	1550	1960	0	0	0
WATER SKIING					
DAYS/CAPITA	.9	1.1	1.3	1.4	1.6
TOTAL DEMAND	31410	36672	43170	46200	53920
STUDY AREA %	0	0	2	2	2
STUDY AREA DAYS	0	0	863	924	1078

TABLE C-8
CHANGES IN USER DAYS DUE TO PROJECT WITH
MITIGATION/COMPENSATION - PESSIMISTIC ESTIMATES

YEAR:	1981	1988	1993	1996	2001
FISHING					
STUDY AREA	0	54	-38353	-43105	-48750
OTHER AREAS	0	151	9838	10105	11680
TOTAL	0	205	-28514	-33000	-37070
BOATING					
STUDY AREA	0	17	7617	8191	10056
OTHER AREAS	0	143	-3298	-4891	-3316
TOTAL	0	160	4319	3300	6740
SWIMMING					
STUDY AREA	0	27	-2454	-2838	-3336
OTHER AREAS	0	460	2212	-462	-34
TOTAL	0	486	-242	-3300	-3370
SIGHTSEEING					
STUDY AREA	0	33	-12026	-13659	-15468
OTHER AREAS	0	240	10535	10359	12098
TOTAL	0	274	-1490	-3300	-3370
PICNICING					
STUDY AREA	0	8	940	1003	1132
OTHER AREAS	0	201	453	-1003	-1132
TOTAL	0	209	1394	0	0
HIKING/CLIMBING					
STUDY AREA	0	28	-4295	-4194	-4910
OTHER AREAS	0	94	1744	4194	4910
TOTAL	0	122	-2551	0	0
WILDLIFE VIEWING					
STUDY AREA	0	8	-4326	-4983	-5385
OTHER AREAS	0	79	1566	-1617	5385
TOTAL	0	87	-2759	-6600	0
HUNTING					
STUDY AREA	0	4	-667	-728	-820
OTHER AREAS	0	23	-277	-436	-492
TOTAL	0	26	-945	-1164	-1312
GOLFING					
STUDY AREA	0	4	25	0	0
OTHER AREAS	0	202	1348	0	0
TOTAL	0	20	1373	0	0
CAMPING					
STUDY AREA	0	-6198	-9735	-11055	-12469
OTHER AREAS	0	6384	7641	11055	12469
TOTAL	0	186	-2094	0	0
WATER SKIING					
STUDY AREA	0	0	863	924	1078
OTHER AREAS	0	42	-593	-924	-1078
TOTAL	0	42	270	0	0

APPENDIX D

ANGLER SURVEY

The Fish and Wildlife Branch personnel who administered the creel census on the Columbia River during the summer of 1980 also administered a more detailed survey to a sample of the anglers. Due to time constraints, the sample size was limited to 21. The questionnaire is included in the appendix with tabulation data for some of the questions.

The results of the survey are reported and discusses in Sections 2.5.1 and 7 of the report.

COLUMBIA RIVER FISHING SURVEY

Summer, 1980

Interview No. 21 Responses Date __/__/__ (day)(mo) Yr)

Time _____

Location _____ Interviewer _____

Access _____

Number in party aug=1.67 10 ones, 8 twos, 3 threes

Q1. Where do you live?

City _____ Province/State _____

Q2. How often do you fish during different seasons?

Summer: m=25.8 =542/21 days during 3 months 1870

Fall: m=11.0 days during 3 months 1570

Winter: m= 3.42 days during 3 months 570

Spring: m=16.57 days during 3 months 1870

Total: m=56.90 days during 12 months 2170

Q3. How often (days per season) do you fish in the following areas?

averages = Total/21

Total 21>0		Summer 18>0	Winter 5>0	Fall 13>0	Spring 17>0
52.86	Columbia River above Riverdale to Hugh Keenlyside dam	24.6	3.57	9.43	14.76
0	Columbia River from Riverdale to Trail	0	0	0	0
1>0 .43	Columbi River below Trail to U.S. Border	1>0 .43	0	0	0
	Other River Locations (specify)	People	Total Counts.		
5	Kootenay River	5			
1	Slocan River	1			
	Other Lake or Reservoir Areas (specify)				
	Kootenay Lake	15	12	2	6
	Nancy Green Lake	1		1	
	Arrow Lakes	11	5	10	17
	Christina Lake	20			
		47	17	13	23
		2.24	.81	.62	1.10

Q4. What attracts you to this part of the river?
(Above Rivervale to Hugh Keenlyside Dam)
(Check no more than 3. 1st 2nd 3rd

1. Close to Home
2. Pleasant Surroundings
3. Easy Access
4. Good Fishing
5. Other (specify) _____

_____

Q5. Are there aspects about this part of the river you don't like?

No 5

Yes 16 Specify _____

_____

Q6. How would you compare this part of the river to fishing further down, say Rivervale, Trail or below?

Q7. How would you compare this part of the Columbia River to the Slocan River, for fishing?

Q8. Do you think the fishing has changed here in the past few years?

No 3 Yes 17

How?

1. Better 10
2. Worse 8
3. Different Species
4. Other (specify)

_____

Q9. If the fishing got worse here, what would you do?

1. Fish here anyway 11
2. Fish elsewhere (specify where else) 10 Lakes 6 Other Rivers 3

_____

3. Other activity (specify what)

_____

Q10. Would you say you fish primarily to have a food supply or more for enjoyment?

1. Mainly for Food 4
2. Mainly for Enjoyment 16

Q11. What percent of your reason for fishing would you say is due to the food you catch and what percent is due to other benefits (enjoyment, exercise, etc.)?

Food _____% Enjoyment, etc. _____% Total 100%

Q12. How much do you usually catch in an average day?

_____lbs. or _____ Fish

Q13. How much does an average day of fishing cost you?

1. Supplies	$	1.18
2. Transportation	$	2.50
3. Other (specify)_____	$	2.25
Total	$	5.93

Q14. If you had access to a boat at no cost would you prefer lake fishing by boat to river fishing from the shore?

Yes 7 No 14

Q15. (Optional)
What is your present occupation?

1.	Homemaker	1	7.	Clerical	0
2.	Tradesman	4	8.	Technical	0
3.	Agriculture	0	9.	Student	1
4.	Labourer	7	10.	Retired	5
5.	Professiona/Managerial	1	11.	Unemployed	1
6.	Service	1	12.	Other (specify)	0

Q16. What is your age?

Approximate aug=49 years

Q17. Do you have any general comments on fishing in the West Kootenays?

THANK YOU FOR YOUR COOPERATION, HAVE A NICE DAY.

APPENDIX F

COMMENTS ON ESTIMATION METHODOLOGY

The impact of the proposed Murphy Creek Project on recreational activities was examined in the context of other opportunities to engage in these activities in the region. In many cases the impact of the project on an activity within the study area was diluted by the magnitude of resident activity outside the immediate study area but within the region. For example, in the case of fishing we estimate that participation rates within the study area will fall by nearly 60%. However, since 1) the study area accounts for only one quarter of resident fishing and 2) some of the reduction in fishing in the study area will be shifted to other areas, the total estimated reduction in fishing days is only 12 percent.

The attached table illustrates the projected impacts for 1988 in a format which makes it easy to see the changes in terms of participation rates inside and outside the study area.

While the changes in participation rates are estimated judgmentally based on anticipated impacts of the project on factors affecting recreational use, the estimates are significantly constrained by the requirment that they make sense in the context of present activitiy levels inside and outside the study area.

USER DAY ANALYSIS - 1993

FISHING

	POPULN	USER DAYS IN S.A.	USER DAYS OUTSIDE	USER DAYS TOTAL	PARTICIPATION RATE IN S.A.	PARTICIPATION RATE OUTSIDE	PARTICIPATION RATE TOTAL
W/O PROJ	33000	57281	160519	217800	1.74	4.86	6.60
WITH PROJ	33208	23113	169493	192606	0.70	5.10	5.80
CHANGE	208	-34168	8974	-25194	-1.04	0.24	-0.80
%	0.63	-59.65	5.59	-11.57	-59.90	4.93	-12.12

BOATING

	POPULN	USER DAYS IN S.A.	USER DAYS OUTSIDE	USER DAYS TOTAL	PARTICIPATION RATE IN S.A.	PARTICIPATION RATE OUTSIDE	PARTICIPATION RATE TOTAL
W/O PROJ	33000	16790	141610	158400	0.51	4.29	4.80
WITH PROJ	33208	22781	139938	162719	0.69	4.21	4.90
CHANGE	208	5991	-1672	4319	0.18	-0.08	0.10
%	0.63	35.68	-1.18	2.73	34.83	-1.80	2.08

SWIMMING

	POPULN	USER DAYS IN S.A.	USER DAYS OUTSIDE	USER DAYS TOTAL	PARTICIPATION RATE IN S.A.	PARTICIPATION RATE OUTSIDE	PARTICIPATION RATE TOTAL
W/O PROJ	33000	26862	461538	488400	0.81	13.99	14.80
WITH PROJ	33208	27031	464447	491478	0.81	13.99	14.80
CHANGE	208	169	2909	3078	0.00	0.00	0.00
%	0.63	0.63	0.63	0.63	0.00	0.00	0.00

SIGHTSEEING

	POPULN	USER DAYS IN S.A.	USER DAYS OUTSIDE	USER DAYS TOTAL	PARTICIPATION IN S.A.	PARTICIPATION OUTSIDE	PARTICIPATION TOTAL
W/O PROJ	33000	35138	255262	290400	1.06	7.74	8.80
WITH PROJ	33208	29233	262997	292230	0.88	7.92	8.80
CHANGE	208	-5905	7735	1830	-0.18	0.18	0.00
%	0.63	-16.81	3.03	0.63	-17.33	2.38	0.00

PICNICING

	POPULN	USER DAYS IN S.A.	USER DAYS OUTSIDE	USER DAYS TOTAL	PARTICIPATION IN S.A	PARTICIPATION OUTSIDE	PARTICIPATION TOTAL
W/O PROJ	33000	7960	213140	221100	0.24	6.46	6.70
WITH PROJ	33208	8010	214484	222494	0.24	6.46	6.70
CHANGE	208	50	1344	1394	0.00	0.00	0.00
%	0.63	0.63	0.63	0.63	0.00	0.00	0.00

USER DAY ANALYSIS - 1993 (PAGE 2)

HIKING/CLIMBING

		USER DAYS			PARTICIPATION RATE		
	POPULN	IN S.O.	OUTSIDE	TOTAL	IN S.O.	OUTSIDE	TOTAL
W/O PROJ	33000	28205	93895	122100	0.85	2.85	3.70
WITH PROJ	33208	24574	98296	122870	0.74	2.96	3.70
CHANGE	208	-3631	4401	770	-0.11	0.11	0.00

WILDLIFE VIEWING

		USER DAYS			PARTICIPATION RATE		
	POPULN	IN S.O.	OUTSIDE	TOTAL	IN S.O.	OUTSIDE	TOTAL
W/O PROJ	33000	7001	82099	89100	0.21	2.49	2.70
WITH PROJ	33208	7173	82489	89662	0.22	2.48	2.70
CHANGE	208	172	390	562	0.00	0.00	0.00

HUNTING

		USER DAYS			PARTICIPATION RATE		
	POPULN	IN S.O.	OUTSIDE	TOTAL	IN S.O.	OUTSIDE	TOTAL
W/O PROJ	33000	3576	21611	25187	0.11	0.65	0.76
WITH PROJ	33208	3317	21257	24574	0.10	0.64	0.74
CHANGE	208	-259	-354	-613	-0.01	-0.01	-0.02

CAMPING

		USER DAYS			PARTICIPATION		
	POPULN	IN S.O.	OUTSIDE	TOTAL	IN S.O.	OUTSIDE	TOTAL
W/O PROJ	33000	9735	184965	194700	0.30	5.61	5.90
WITH PROJ	33208	9796	186131	195927	0.29	5.61	5.90
CHANGE	208	61	1166	1227	0.00	0.00	0.00

WATER SKIING

		USER DAYS			PARTICIPATION		
	POPULN	IN S.O.	OUTSIDE	TOTAL	IN S.O.	OUTSIDE	TOTAL
W/O PROJ	33000	0	42900	42900	0.00	1.30	1.30
WITH PROJ	33208	863	42307	43170	0.03	1.27	1.30
CHANGE	208	863	-593	270	0.03	-0.03	0.00

APPENDIX F

THE VALUE OF A USER DAY

In order to arrive at an economic measure of the impact of a proposed hydro-electric project which can be compared with its benefits, one must estimate the value of the user days which are gained or lost as a result of the project. A number of estimates have been developed in recent years. While obtaining separate estimates for each type of user day lies outside the scope of this study, we felt we did have an opportunity to develop an estimate of the value of a fishing day since the study design included interviews with fishermen.

Estimates of user day values are generally based on one of two basic approaches. One involves asking participants in a particular recreation activity (1) how much they would be willing to pay for each day, or (2) how much they would have to be paid in order to willingly forego each day. The validity of the answers to these questions is suspect because respondents have difficulty arriving at a dollar amount and because some respondents provide biased responses in support of their perceived interests. The second approach is based on studies of the costs which participants incur in order to engage in a particular recreational activity. It is assumed that the gross benefit of a recreation day must be at least as large as the expenditures incurred to engage in the activity. This approach requires substantial amounts of data and, since the incurred costs tend to be travel costs, is not appropriate for a local

fishery like that on the Columbia River in the study area. We have devised a scaling approach to estimate user day value.

This approach asks the respondent to compare the food benefits of fishing to the other recreational values by indicating what percent of the total benefits of fishing are due to each component. Since an estimate of the food benefits is available in the marketplace, this relative scaling of the two components can be used to produce an estimate of the total value of a user day.

The specific questions asked to obtain the necessary information were:

Q10. Would you say you fish primarily to have a food supply or more for enjoyment?

1. Mainly for Food
2. Mainly for Enjoyment

Q11. What percent of your reason for fishing would you say is due to the food you catch and what percent is due to other benefits (enjoyment, exercise, etc.)?

Food _____ % Enjoyment, ect. _____ % Total 100%

Q12. How much do you usually catch in an average day?

_____ lbs. or _____ Fish

Q13. How much does an average day of fishing cost you?

1.	Supplies	$
2.	Transportation	$
3.	Other	$
	Total	$

Due to resource constraints, responses were obtained from only eighteen fishermen. Their answers and the gross and net user day values implied are presented in Table F-1.

TABLE F.1

FISHING DAY VALUE CALCULATION

NO.	% DUE TO FOOD VALUE	LBS. FISH CAUGHT	VALUE OF FISH	TOTAL VALUE	COSTS	NET VALUE
1	25	.25	$ .75	$3.00	$5.00	$-2.00
2	75	2.	6.00	8.00	3.00	5.00
3	30	3.5	10.50	35.00	3.00	32.00
4	10	3	9.00	90.00	.00	90.00
5	80	1	3.00	3.75	4.00	- .25
6	25	2	6.00	24.00	3.00	21.00
7	50	2	6.00	12.00	2.50	9.50
8	25	.5	1.50	6.00	1.00	5.00
9	30	2	6.00	20.00	2.00	18.00
10	40	2	6.00	15.00	1.50	13.50
11	25	2	6.00	24.00	3.00	21.00
12	33	7	21.00	63.00	5.00	58.00
13	25	2	6.00	24.00	.05	23.95
14	50	4	12.00	24.00	2.00	22.00
15	40	2	6.00	15.00	5.00	10.00
16	50	2	6.00	12.00	3.00	9.00
17	70	2.5	7.50	10.71	2.00	8.71
18	20	4	12.00	60.00	4.00	56.00
avg.	39.1%	2.43	$7.29	$24.97	$2.73	$22.25
std dev	(19.3)	(1.48)	(4.44)	(22.79)	(1.49)	(23.05)
median	30	2	$6.00	$20.00	$3.00	$18.00

The net value is found by subtracting costs from the value of fish caught and dividing by the fraction of total value due to food. Since the relative scaling is appied to a market price, the result can be regarded as a willingness to buy measure.

BRITISH COLUMBIA HYDRO AND POWER AUTHORITY

TERMS OF REFERENCE
FOR
ENVIRONMENTAL STUDIES
FOR THE
PROPOSED MURPHY CREEK
HYDROELECTRIC PROJECT

April 1981

SYSTEM ENGINEERING DIVISION

TERMS OF REFERENCE

FOR ENVIRONMENTAL STUDIES FOR THE PROPOSED

MURPHY CREEK HYDROELECTRIC PROJECT

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A. Geology and Landforms
B. Hydrology and River Morphology
C. Water Quality
D. Climate
E. Agriculture
F. Vegetation
G. Forestry
H. Wildlife
I. Fish and Aquatic Habitats
J. Socio-economic Impact Analysis
K. Recreation and Tourism
L. Heritage Resources
M. Resource Analysis
N. Land Use
O. Downstream Water Use

1.0 INTRODUCTION

These Terms of Reference are for detailed ecological and socio-economic studies, called the "Studies", which are required for environmental impact evaluation of a potential hydroelectric development by the British Columbia Hydro Electric and Power Authority (B.C. Hydro) on the Columbia River in the vicinity of Murphy Creek.

Prior to signing the Columbia River Treaty in 1961 and its ratification in 1964, numerous studies were made of the hydroelectric development of the Columbia River in Canada. The Treaty between the United States and Canada led to the construction of Mica, Hugh Keenleyside and Duncan projects in Canada. Other major hydroelectric projects in the Columbia River basin in Canada include the Kootenay Canal project completed in 1975, and the Seven Mile and Revelstoke projects which are under construction.

The potential of the Murphy Creek site was first identified in 1956. Consideration of the development of the project was more recently given during the 1972 B.C. Energy Board studies. Subsequently, preliminary engineering and environmental studies were carried out in 1977 and 1978, to examine the project potential at a prefeasibility level and to identify probable environmental impacts.

The Murphy Creek site is located on the Columbia River approximately 3 km upstream of the city of Trail and 25 km downstream of the confluence of the Columbia and Kootenay rivers. The tentative layout for the project consists of an earthfill dam, approximately 33 m high, extending across the river from the left bank to a concrete spillway and 10-unit powerhouse located on the right bank. A total installed capacity of 400 MW would be provided by ten 40 MW turbine generators.

In early 1979 a preliminary study of the residential, commercial and industrial properties that may be affected by the

1.0 INTRODUCTION - (Cont'd)

project was undertaken by the Properties Division. An engineering feasibility study scheduled for completion by the end of 1980 is in progress.

All field work associated with the Studies outlined in these Terms of Reference is scheduled for completion in 1980 where possible, in order that environmental impacts may be properly assessed by mid-1981. The engineering feasibility study associated with the project is being carried out by the Hydroelectric Generation Projects Division of B.C. Hydro, who will also be responsible for several aspects of the Studies such as geology, hydrology and river morphology.

2.0 STUDIES AREA

The Studies area consists of all lands on either side of the Columbia River from the axis of the proposed dam in the vicinity of Oasis, upstream to the Hugh Keenlyside dam on the Columbia River, and to the Brilliant dam on the Kootenay River, up to an elevation of 500 m. Studies may extend beyond this area in specific cases where considered necessary.

Some areas outside these limits will be studied for socio-economic impacts from both the construction work force and the operating staff.

3.0 STUDIES OBJECTIVES

1. To provide an inventory of environmental resources that could be impacted by the potential project within the Studies area. This will be compiled from on-site investigations and other available sources.

2. To provide a qualitative and quantitative evaluation of impacts, both adverse and beneficial, which would result from the potential project.

3.0 STUDIES OBJECTIVES - (Cont'd)

3. To provide an evaluation of resource losses and gains in monetary terms for inclusion in a benefit-cost analysis.

4. To provide an evaluation of opportunities for practical mitigation and compensation measures which would avoid or reduce adverse impacts created by the development.

5. To provide data which could be needed for preparation of an Environmental Impact Statement for the potential project.

4.0 STUDIES ORGANIZATION

(a) Co-ordination

The entire program will be directed and co-ordinated either by B.C. Hydro, or by B.C. Hydro assisted by a prime consultant. Under this direction, certain disciplines of the Studies will be carried out by B.C. Hydro staff or by consultants. Technical responsibility within individual disciplines will rest with the B.C. Hydro staff or with respective consultants. B.C. Hydro or its prime consultant will assume the role of co-ordinating the individual disciplines during the Studies period and during the preparation of the final report.

Consultants should liaise with the appropriate government agencies both before and during their studies to ensure that full use is made of existing available information and knowledge.

Consultants, subconsultants and their staff shall co-operate with all other consultants hired by B.C. Hydro for the same or similar projects, and on request by B.C. Hydro shall make available to such consultants all material gathered or produced for this project.

4.0 STUDIES ORGANIZATION - (Cont'd)

B.C. Hydro has an ongoing Community Relations program associated with this project. All contact with outside agencies and the public shall be co-ordinated with the Community Relations program through B.C. Hydro. B.C. Hydro should be advised in advance of the need for any formal contact with local or regional governments and the public.

(b) Studies Sections

The Studies shall be organized into four groups: Physical Resources, Terrestrial Resources, Aquatic Resources and Socio-economic. Each group is composed of closely related subjects called "Sections" A to O, as follows:

Physical Resources

A Geology and Landforms
B Hydrology and River Morphology
C Water Quality
D Climate

Terrestrial Resources

E Agriculture
F Vegetation
G Forestry
H Wildlife

Aquatic Resources

I Fish and Aquatic Habitats

4.0 STUDIES ORGANIZATION - (Cont'd)

Socio-economic

J Regional Economy and Human Communities
K Recreation and Tourism
L Heritage Resources
M Resource Analysis
N Land Use
O Downstream Water Use

5.0 STUDIES METHODOLOGY

Evaluation of the environmental impact of the project shall take into consideration all project actions associated with the development. These shall include pre-project activities such as field investigation or land acquisition; construction activities such as site and reservoir clearing, dam, powerhouse and road construction, construction camp activities; and operation and maintenance of the powerplant. Project descriptions will be provided by B.C. Hydro.

Definition and development of all methodologies for the Studies should be made early in the program and provided to B.C. Hydro for their approval. This may include the use of various impact matrices, mapping techniques, economic analyses, etc. The methodology for evaluation in each of the Sections shall be consistent with criteria selected for the evaluation of the environmental impact. Special attention shall be directed to providing information suitable for inclusion in a benefit-cost analysis of mitigation and compensation alternatives.

The following is provided by B.C. Hydro to give direction on the scope of the Studies:

1. All resources and their significance, with and without the project, on a local, regional and provincial scale based upon present value and potential value.

5.0 STUDIES METHODOLOGY - (Cont'd)

2. Environmental impacts including:

   a. Primary, secondary and induced impacts.

   b. Beneficial and adverse effects.

3. Distributional aspects of impacts including:

   a. Geographical - local, regional, provincial and international.

   b. Social - impacts on various segments of the population, ethnic or special interest groups.

   c. Transfer of resource demands to other locations.

4. Probability of occurrence of an impact and reasons for uncertainty of the impact's occurrence.

5. Expected time and duration of an impact occurrence. A distinction shall be made between short-term impacts (those which last for the construction period only) and long-term impacts (those which persist after construction).

6. Possible benefits, both short and long-term, of all compensation and mitigation measures.

7. The costs associated with all compensation and mitigation measures.

8. Relationship between project impacts and long-term regional development prospects shall be evaluated.

All sources of data, information and references shall be thoroughly documented.

6.0 REPORTING PROCEDURES

Written reports will be required for all Sections of the Studies. The number of copies of such reports will be established at the time study proposals are called for. Prior to the preparation of these reports, consultants will be required to submit a report outline to B.C. Hydro for review and approval. Subsequently, draft reports will be prepared and submitted for review and approval by B.C. Hydro and, where necessary, by outside experts before they are accepted. All final reports shall be in a form suitable for release to government agencies and the public.

Following completion of all the reports for the Sections, B.C. Hydro or its prime consultant will prepare an integrated summary report in consultation with the authors of the Sections and outside experts, where necessary. This report will be the final report of the Studies.

7.0 STUDIES SCHEDULE

The Studies will be undertaken in 1980 and possibly beyond. A target schedule showing specific deadlines will be issued for each Section.

8.0 STUDIES SECTIONS

The following are guidelines for each of the Sections. These guidelines distinguish between inventory and assessment work and, where feasible, this distinction should be made in report preparation.

SECTION K

RECREATION AND TOURISM

(a) Inventory

1. Describe present facilities and activities in the study area including use of the waterway as a transportation corridor for recreation activities.

2. Estimate level of use in user days by activity and site.

3. In co-operation with the resource analysis consultant, determine day-use values based on willingness to pay and willingness to sell.

4. Estimate recreational capability of the area without the project, in terms of existing uses, development plans and future possibilities, and estimate the cost of developing this capability.

(b) Effects of Development

1. Predict the loss of recreational and tourism features and opportunities due to reservoir impoundment.

2. Assess the area's capability to meet recreation demand with the project, and estimate the cost of developing this capability.

3. Estimate the demand for recreational activites with the project expressed in user days.

4. Special emphasis regarding opportunities for mitigation, compensation of and enhancement possibilities should be given to activities lost at Pass Creek Park.

POOR

QUALITY

ORIGINAL